THE YOUTH'S COMPANION SERIES

INDUSTRIES OF TO-DAY

GINN & COMPANY
PUBLISHERS

Making Maple Sugar

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EDITED BY

M. A. L. LANE.

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THE YOUTH'S COMPANION SERIES

GEOGRAPHICAL READERS

THE WIDE WORLD
NORTHERN EUROPE
UNDER SUNNY SKIES
TOWARD THE RISING SUN
STRANGE LANDS NEAR HOME

THE WORLD'S PROGRESS READERS

TRIUMPHS OF SCIENCE
INDUSTRIES OF TO-DAY

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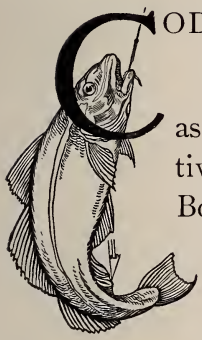


COD AND COD FISHING

"How strange," thought I when as a boy I visited the Representatives' Hall in the State House at Boston, "how strange that above the heads of the wise men assembled in this hall should hang a huge codfish!"

But it does not seem strange at all when we recall the circumstances of the founding of the Commonwealth of Massachusetts.

There were then no cattle grazing among the foothills of the Rocky Mountains, no sheep on Texan plains, no wheat or corn on Western prairies, no trains loaded with meats and grain rushing night and day toward the seaboard, and no vessels freighted with luxuries from every clime hastening to the Atlantic ports. A little corn gathered from newly broken soil among the

stumps of the clearings, clams from the sands, and fish from the deep, — these constituted almost the only subsistence of the colonies along the shore, where alone settlements had been made.

Of the many fish which then abounded, the cod was the most abundant and most highly prized; and so to the Pilgrim and the Puritan the codfish was a memorial of providential care, as was to the Israelites the golden pot of manna which found a sacred place beside the ark of the covenant.

It was very early discovered that the waters along the shores of Newfoundland and the adjacent Banks abounded with cod, and they were visited by the French as early as 1504, and by the Spaniards in 1517. Nearly three hundred and fifty years ago the English, under the lead of Sir Francis Drake, began to frequent the Banks, and during all the years since fleets of vessels from these and other nations have braved the perils of fog and storm in order to secure a supply of this valuable sea food.

Bartholomew Gosnold, the first navigator known to have visited New England waters, explored its coasts in 1602, and on reaching the

sandy cape of Massachusetts found the fish so abundant that he "pestered his deck" with them, and was led to bestow upon the peninsula the name "Cape Cod," which it still bears.

About 1614 the famous Captain John Smith was elated by his catch on the coast of Maine, at the Isles of Shoals, and around the headlands of Cape Ann. In writing of it he says, "What sport doth yield a more pleasing content and less hurt or charge, than angling with a hook, and crossing the sweet air, from isle to isle, over the silent streams of a calm sea!"

The Shoals were considered a most desirable place for a station, since here the men were safe from the prowling Indians as they were not on the mainland, where, however, by 1640, fishing plantations had been established at Pemaquid, Casco Bay, Cape Porpoise, and Piscataqua.

The cod along our shores differ a little from those on the Banks, being of another species. They are not migratory fish, like the mackerel, but live in great colonies, having only a limited range. Although they may live in very near waters, it is said that they do not intermingle with those of a neighboring colony. The fish

of each has characteristics which distinguish it from those of another.

In general it may be said that the cod is of a greenish brown, when fresh from the water, and is spotted with reddish yellow. It can be distinguished from the haddock, with which it often feeds, by its white lateral line. The line on the haddock's side is always black. In the upper jaw there are four rows of sharp teeth; in the lower, one row. The scales are small and the eyes large. There are ten fins, three of which are upon the back.

I have seen a codfish that weighed nearly one hundred pounds, and have heard of one caught near by that weighed more than one hundred and fifteen pounds; but one of eighty pounds is considered a large one even by fishermen, and an amateur will go wild over one of twenty. Those caught upon the Banks seldom reach eighty pounds, being of a smaller species.

The cod is a deep-sea fish, as is indicated by a little appendage hanging from its lower jaw, called a "barbule." It finds its food at the bottom, upon sand banks and around sunken ledges usually at some distance from the shore,

although in cold weather it may sometimes be taken by fishing from the rocks.

As the season advances the cod resorts to deeper water, for it is strictly a cold-water fish. Its food consists of worms, sand eels, crabs and other small shellfish, but it is not over-particular as to what it swallows. A great variety of articles has been taken from the stomachs of cod, — straw, stones, rubber balls, jackknives, snuffboxes, nutmegs, old iron, glass, and broken crockery.

The Indians caught fish with lines made of bark and with hooks of bone. Formerly all cod were caught by means of hand lines, and some fish are still taken in this way, especially in the autumn, when they are abundant. Most of them, however, are now taken by trawls, which were introduced here about 1860 and were first used by the French.

A trawl consists of a line about three thousand feet in length, to which are attached short ones about thirty-six inches long, on each of which is a hook. The short lines are placed about six feet apart, so that each trawl has about five hundred hooks. Attached to each end of the line by a rope is a buoy, sometimes only an empty

powder keg or a mackerel kit. In the head of the buoy is a pole three feet long, upon which is a small flag to attract the attention of the owner when in search of it. To each end of the line is fastened a small anchor.

The hooks are usually baited with squid, herring, or other small fish. Each fish will bait four hooks. If small fish cannot be obtained, clams are used. Squid bait is considered the best, and as great quantities are caught in weirs on Cape Cod, many vessels resort thither in summer to secure a supply for their trips.

To bait a trawl requires from an hour and a half to two hours. When it is ready it is placed in a tub made of a half barrel. The long line is coiled up in the center, and the bait lies next the sides of the tub. One man uses from two to six trawls, which are often set in the afternoon and visited very early the following morning, and perhaps once or twice more in the course of the day.

The process is somewhat as follows. When one buoy is reached the end of the trawl to which it is attached is drawn up, and then hook after hook is examined and the fish are taken off. By means of trawls a man may catch more

in a single night than by a week's hard work with hand lines.

Of course the fish are not all cod. This is a hake, that a haddock, the next a dogfish, and the next a halibut. The unexpected is quite likely to

come to the surface upon one of the many hooks. It may be some hideous fish, or some uncouth object which has long been lying in its oozy bed.

I have described trawl fishing as conducted by one or two men in a dory at from one to five miles from the shore.

Small schooners make trips off shore to a distance of from twenty to a hundred miles. They take a supply of ice as well as of bait, and run in to Boston or some other port once or twice a week to sell their fish to dealers who supply New England.

Larger schooners visit Georges Banks, the Western Banks, or those of Newfoundland, and may be gone three or four weeks, bringing their fish to market on ice; or they may be gone from four to six months, dressing and salting their fish on board.

When a schooner arrives at port with a "fare of fish," they are taken out with pitchforks, washed, and, when the weather is suitable, spread upon flakes to dry. The flakes are frames covered with triangular slats, and are about seven feet wide and raised three feet above the ground. At Provincetown they may be seen not only upon the wharves, but also in all vacant places between the houses, and even in the front door-yards, so that, instead of the fragrance of flowers, the smell of codfish regales the passer-by.

Great care is required to dry fish properly. Clear weather and westerly winds are most to

be desired. Foggy weather spoils them, and a hot sun melts, or, as the fishermen say, "nashes" them. To prevent this, screens made of cotton cloth are often placed eighteen inches above them as a protection from the sun's direct rays.

"Going on your own hook" had its origin in the custom of keeping an account of each man's catch, and the distribution of the profits of the voyage accordingly.

Great economy is now exercised in saving all parts of the fish. The flesh, of course, is used for food. The oil from the livers is sold as medicine or used in manufactures. The air bladders, or sounds as they are called, are dried with care, and in cold weather are converted into isinglass; and there is now a great demand for the heads, skins, and even bones, which are used in making fish glue. This refuse, formerly of little value, now commands a good price.

To secure bait for the Bankers, a fleet of vessels sails about the last of November for Newfoundland, where they trade with local fishermen for herring, which are well frozen. They return home in January or February, so that they may supply the fleet which starts in February or

March. Large quantities of herring are also obtained from New Brunswick. Without this foreign supply the extent of our fisheries would be very much reduced, and even now it is too often the case that when fish are abundant there is no bait, and when bait is plenty there are no fish. A crew of eight men on a three weeks' trip would take about twelve thousand herring.

The perils of the trawler are even greater than those of the soldier upon the battlefield. There is danger even in shore fishing, as a sudden lurch of the dory may throw its occupant into the icy cold water. Clad in heavy fishing boots, thick coat, and reefer, the fisherman has little hope of rescue, unless another boat should chance to be near.

Even greater is the danger on the Banks. The trawler is often four or five miles from the vessel, when suddenly the thick fog closes in upon him and he is lost, perhaps to row for days in hopeless search, without food or drink or compass. He may die of hunger or exhaustion, or perhaps be picked up at length by some passing vessel and taken to some distant port. Although horns are blown in warning, a whole crew may

be sunk in an instant by some steamer on its way across the ocean.

Fierce, too, are the storms which sweep the Banks; the wind is bitter cold, deck and mast and sails are clad in ice, and many a crew is never heard of more. In March, 1766, nineteen vessels sailed from Gloucester for the Grand Banks. In a single storm two of these were wrecked on the rocks of Nova Scotia, seven foundered at sea with all on board, and several others were so disabled as to be compelled to return. On the night of February 24, 1862, fifteen vessels from the same port were wrecked.

Previous to the Revolution, Marblehead was the chief fishing port, and her men were on the deck of every ship which met the British men-of-war. Gloucester, now the largest fishing port in the world, gave a third of her sons to death in their country's defense in the same great struggle. Nor were these men of the sea less prompt to answer the call of the nation in later wars. Let her foster this great industry and protect the brave men who, amid hardships and perils, go forth to gather harvests from the deep.

GRANVILLE B. PUTNAM.

RANCH LIFE

The word "ranch" is a contraction of the Spanish word *rancho*, which means a hut covered with branches or thatch for herdsmen, or a farming establishment for the raising of horses and cattle.

On the plains and in the Southwest the word has come to be applied indiscriminately to all farms, whether the land be used for grazing or for agricultural purposes.

The word has a seductive sound. It suggests beautiful and picturesque surroundings, green trees, running streams, and a life of freedom and plenty; and I shall not soon forget the disappointment with which I first looked on a Colorado ranch.

I saw a small, unpainted house a story and a half high; a few outbuildings made of logs in the roughest manner; no fences, not a tree in sight, not a bush; chips and other litter all around; tin cans lying about in abundance, — a most

desolate-looking spot, with discomfort and deprivation staring one in the face at every point.

This was a cattle ranch. The proprietor of it owns several thousand head of cattle. He himself lives in a good house in Colorado Springs.

This is the most comfortable way to keep a ranch: put a man, or men, in charge of it, and live yourself where you please, visiting the ranch often enough to see that things are in order. But of course this method is not always possible.

The principal grazing sections in Colorado are along the Platte, the Arkansas, and the Republican rivers, but the plains in all sections are thus utilized. Some of the parks lying high up among the mountains also afford fine ranges.

To the eye of a stranger nothing could look more unsuited for grazing than the bare brown stretches of the Colorado plains. But there is a sweetness and nutrition in the low, dried grasses which is wonderful. No hay that is made can compare with these grasses dried where they stand and ready to be nibbled all winter.

To a stranger nothing could seem more improbable than that cattle should thrive, running all winter long unsheltered, uncared for, in a country

where the mercury frequently falls at night to zero and below, and where snow often covers the ground to the depth of several inches. But the facts show that the cattle do thrive under these conditions.

They are very thin in the spring, and exceptionally severe snowstorms in March or April will kill off some of the feeblest; but at the end of the year they make, on the whole, fair returns, and there are many cattlemen in the state who are growing steadily rich.

The same is true of the sheepmen, though this business is subject to greater risks and fluctuations. When heavy snowstorms come sheep are helpless; they are silly also, and sometimes in a single flock hundreds will be stifled to death by trampling one another underfoot in haste to get the food which has been thrown down for them when they have been driven in after a long storm.

One winter in Colorado was exceptionally severe, and thousands of sheep perished in the snow. The sheepmen took warning and put up sheds on a large scale. It would seem a simple matter of humanity, as well as policy, to provide

them. Cattle can run before a storm and, it is said, will often run forty miles to escape one; but the poor little sheep are too clumsy and slow; they are soon snowed in and under.

Life on the larger and more remote ranches is lonely and monotonous to a degree which, it must be admitted, can hardly be wholesome for

either mind or body. The daily life of a herder of sheep, for instance, seems but one shade above that of the sheep themselves. He takes his flock out at daybreak, stands or lies still, watching them while they feed, drives them back to the ranch at night, cooks his own supper, washes the dishes, and goes to bed at nine o'clock, too tired to keep awake longer. This routine is varied by an interval of very hard work in the shearing

season and during the weeks when the lambs are born in the spring.

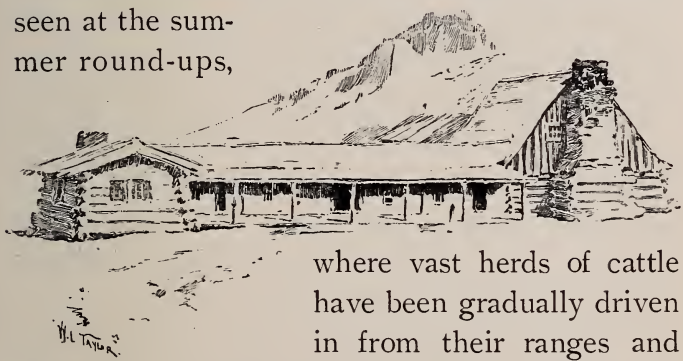
If the ranch is near a town of size, he goes, perhaps once a week, to that town to buy what he needs. But the larger ranches are all remote from towns and must necessarily be so in order to secure sufficient range for large flocks and herds.

For a ranch sixty, seventy, or a hundred miles distant from its center of supplies, purchases must be made by wholesale two or three times a year, and the ranchmen have no intercourse with the world except at these times, or when chance travelers pass by their place. A primitive and genuine hospitality prevails on most ranches; all travelers feel free to stop at them, and by no means the least of the fatigues of the ranchman's life is preparing meals at any time for as many as happen to come.

These are some of the drawbacks of ranch life. On the other hand, there are advantages by no means to be scorned: open air, year in and year out; freedom from all conventional and troublesome customs; independence; and the indefinable exhilaration which almost all men find in a wild and untrammeled life.

The cattlemen for a great part of the year have little to do except to keep their buildings in order and attend to the few animals they keep with them. When the cattle are to be gathered together, branded and counted, or driven from one range to another, then the cattleman rides, day after day, as madly as a Bedouin in the desert.

There is probably no better riding than can be seen at the summer round-ups,



where vast herds of cattle have been gradually driven in from their ranges and collected in a dense mass in some open place where the owners may pick out their respective cattle. Any cow or steer found unbranded then may be taken possession of by any one. Such cattle are called mavericks, and there are more of them than would be supposed; they might be called Ishmaelites among cattle.

As the ranchman prospers, he adds building after building to his ranch. You may read the history of many ranches in the successive stages of buildings, from the roughest of log cabins, which was at first the dwelling and is now merely an outhouse for tools, implements, etc., up to the two-story wooden house, possibly clapboarded, which was at first the dream and is now the home in which the ranchman's wife takes pride, and in which you will find one or more carpeted rooms, a rocking-chair or two, and a newspaper or magazine.

I know one ranch, a sheep ranch, in which the record runs farther back than the log house; it runs back to a dugout, a sort of compromise between a cave and a huge oblong ant-hill, in which the resolute sheepman lived, or rather burrowed, for more than a year, when he began his ranch life, like David, with a few sheep in the wilderness. Now he is the owner of two ranches and many thousand sheep.

HELEN HUNT JACKSON.

PEANUT GROWING

Many people would mistake a field of growing peanuts for a field of clover. During the Civil War the boys in blue often ran with eagerness into clover fields in search of peanuts, and could not be convinced of their mistake until they had pulled up a considerable number of the roots, and had been roundly laughed at by their more knowing comrades.

The peanut, sometimes called ground pea or ground nut, is known in the Southern States as the pindar and goober. It is generally believed to be a native of Africa, where it is the principal food of some of the Congo tribes; but four or five species of the nut are found growing wild in Brazil.

In the United States it is raised principally in Virginia, North Carolina, and Tennessee, and has been more recently cultivated in California.

The culture of the peanut is not difficult. Land suited to the raising of corn or melons is

generally selected, and care is taken that there be nothing in the ground that would stain the shells.

Planting time begins when the danger to plants from frost has passed. The ground is plowed five or six inches deep, and then harrowed. The nuts are taken from the pod without breaking their skins, are planted two or three together in rows about three feet apart and twenty inches from hill to hill, and are covered with two inches of earth. Five pecks of shelled seed are needed for an acre. The work of planting was formerly done by hand, but it is now done by a machine, with which one man can plant six to eight acres a day.

When in a short time the vine is eight or ten inches long and begins to blossom, it is covered with an inch of soil, care being taken to leave the tip end uncovered. The vines blossom profusely with small yellow flowers, and as the flower fades away a sharp-pointed stem grows out from

its base, turns downward, and buries itself in the ground; on the end of the stem a thick-shelled pod forms, and enlarges rapidly.

All the care that is necessary after the stem returns to the ground is to keep the land free from weeds. The cultivation consists in running a plow between the rows. After the plants have

fallen over, they cover the earth so thickly as to smother all other growth.

In October, when the nuts are ripe, the farmer loosens the earth by running a plow under each row to cut off the main roots and throw out the pods. Then he pulls up the vines, to which the nuts adhere, and turns them over to dry. He performs this work only in pleasant weather and when the ground is dry.

After the vines have lain in the sun for a day, which is generally a sufficient time for drying them, the grower stacks them around a stake about seven or eight feet high. The vines remain in stack from three to five weeks, after which the nuts are picked off, placed in sacks, and shipped to market. A vine under favorable conditions bears more than a hundred nuts, and the yield per acre averages forty bushels.

Most of the Virginia and North Carolina crop, which is about two thirds of the whole crop of the country, is marketed in Norfolk and Petersburg, Virginia. In each of these cities are factories where the nuts are bought as they are delivered by the farmer. The nuts as they appear at this stage, with earth and their stems still clinging to them, are hardly to be recognized as the bright nuts we afterwards see on the corner stand.

To polish them and to remove the earth and stems, the nuts are scoured in large iron cylinders, from which they pass through blast fans, in which a strong current of air separates the fully developed nuts having sound kernels from those imperfectly filled, and from empty pods.

The sound nuts fall through the fan upon long picking tables, where those which are discolored are taken out, and the bright ones are passed on into sacks which will each hold about one hundred pounds of nuts. Each sack is marked with the brand which indicates the grade of its contents.

The dark and the partially filled nuts are

shelled, and the kernels are used by confectioners in making peanut candy. The work of picking over and separating the nuts is performed by little girls, about twenty of whom are employed at every table.

Three varieties of peanuts are grown in America, — the white, the red, and the Spanish. The white, which is the most important variety, has two kernels with pink skins; its vine spreads along the ground, unlike that of the red variety, which grows more upright and in a bunch.

The pod of the red nut holds three and sometimes four kernels, and has a deep red skin. The

Spanish is a much smaller nut, with a lighter skin and milder flavor than either of the others. The entire crop is shelled, and used especially in that rich confection known as nougat.

The history of the competition between the home product and the imported peanut is interesting and gives one some idea of the importance of the peanut trade. In 1872, and for several years previous, there were annually imported into New York a half million bushels of peanuts, the greater part of which came from Africa, and the rest from Spain.

The American farmers gradually awakened to a perception of the profits to be made by raising the nuts. Melon patches were turned into peanut fields, and in 1878 the seed of the Spanish nut was planted in Virginia. The product was found to equal that of the foreign nut, and as it cost two or three cents a pound less to market the crop, it was not long before the imported nut was driven from the market. At present Virginia, North Carolina, and Tennessee count goober raising as one of their chief industries.

The peanut is a more useful product than people in general think it to be. We all know how eagerly it is sought after to help boys enjoy a baseball match or a circus; but its use in the roasted form by no means measures the extent of its value or the variety of the uses to which it is put.

The nuts contain from forty-two to fifty per cent of a nearly colorless, bland, fixed oil, which resembles olive oil and is used for similar purposes. This oil is principally employed in the manufacture of the finer grades of soap.

In 1883 Virginia began to manufacture peanut flour, which makes a peculiarly palatable biscuit, and North Carolina has long made pastry of pounded peanuts. It is also eaten for dessert, and it is roasted as a substitute for coffee.

The peanut is very nutritious. The negroes use it in very many places in making porridge or custard, and prepare from it a beverage. The vine forms a fodder as good as clover hay, and hogs fatten on what they find on the fields after the crop has been gathered.

GEORGE B. SPEAR.

A WINTER HARVEST

The traveler who, on a pleasant midsummer day, ascends the Kennebec River in Maine for the first time, is likely to be much interested in the signs, which appear as soon as his boat has passed from salt water into fresh, of a great industry which evidently surpasses all others in local importance.

At frequent intervals upon the Kennebec are seen great wooden structures. Some of these have wide-spreading gambrel or curb roofs, and are picturesque objects in the landscape; others are simply vast barracks of rough planks and boards, unpleasant and disfiguring to the shores of the broad river. All of these are ice houses, and they are the depositories of the great ice harvest of the Kennebec.

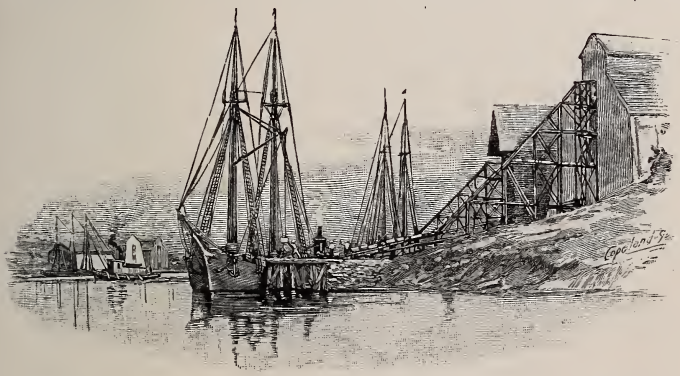
In midsummer scarcely less than in the latter half of winter these great houses are scenes of activity. Schooners are brought to their very doors by tugs, and there are laden with great

blocks of clear, blackish-green ice. From each of the ice houses a long and slightly inclined plane leads down to the light wooden wharf where the vessel lies; and down this smooth incline a continuous line of blocks of ice, urged on by men and boys with picks, is descending.

The Kennebec River is a great center of the ice-cutting business because, joined with a winter climate which makes ice a tolerably sure crop, it has a wide stretch of navigable fresh water. Clear blocks may be cut here over the very spot where next summer ocean vessels will receive their loads of ice to be taken directly to the cities on the coast farther south.

Perhaps the business of harvesting ice on a great Maine river comes nearer to the fabled plucking of apples of gold from the trees in the garden of the Hesperides than anything else in modern practical industry. The ice, to begin with, is nature's gift to everybody. There is no property in it, no ownership of it by any one, until it has been marked out to cut; and any one may do that and possess the ice if he is able to cut it afterward.

But this free gift of nature brings to those who live on the Kennebec River, along the twenty-five miles from Augusta, where there is a dam, down below the foot of Swan Island, where the water begins to be brackish, a yearly income of from one to four millions of dollars, according



to the price for which they sell their crop of a million to a million and a half tons of ice.

To the Kennebecker, therefore, the winter is the real harvest time. That is the season when fortunes are most readily acquired by the enterprising, and employment is most easily found by those who need it.

An ice claim must be marked out anew each year, and preëmpted over again as often as the

ice melts away. On the Kennebec, as soon as the ice is strong enough to bear a man, the claim is staked out by setting bushes or stakes in the ice, or often, where it is very systematically done, by setting in joists with boards nailed across them.

The construction of an ice house on the bank carries with it, in practice, the right to cut the ice on the river in front of it; and as the ice could not be secured without an ice house in which to store it, only those who are able to get a foothold on the land can gather the ice harvest, theoretically free to all.

There is nothing to do after the claim is marked out until the ice has become thick enough to carry a horse, so that the snow may be scraped off as fast as it falls. Ice will not make rapidly under snow and will not attain its full thickness. The iceman's most anxious time is when there is danger of a snowfall on the ice before it is strong enough to bear horses to scrape it.

If the snow steals a march on the scrapers in this way, it is often necessary to get rid of it by a very laborious and expensive process. A hole is cut through the ice, and the snow saturated

with water. When this freezes the ice will bear a horse; but the worthless snow ice thus formed must be planed off, also by horse power, with a planer made for the purpose. The scraping and planing is called cultivating the ice, and it is generally a very expensive sort of cultivation. In a single night the fall of snow may be so heavy that the cost of its removal will amount to five or six thousand dollars.

The iceman's crop is nearly ripe when clear ice has formed to a thickness of twelve inches, and then the preparations are made for the harvest.

From the point on the shore where the elevator leading to the ice house reaches the brink a canal from five to twenty feet wide, according to the magnitude of the business, is opened out into the river, through which the blocks of ice are presently to be floated to the house.

This canal must be kept clear as long as the ice harvest continues, no matter to how many degrees below zero the mercury may fall. During the day the constant moving of ice blocks through the water suffices to keep the channel open; at night, in freezing weather, the necessity gives

rise to one of the coldest and most lonesome occupations that one can imagine.

Armed with a great triangle of heavy pieces of wood, which he drags through the water, a man marches up and down the channel all night long, crushing and scattering the thin sheets of ice with his triangle as fast as they form. The workman to whom this cheerless task falls must be heartily glad that the gray wolves no longer make the frozen Kennebec a thoroughfare.

With the opening of the canal comes an interesting result at once. The thickness of the ice is increased by the exposure of the water and the cooling of its surface. The cold is let into the river, as it were, both below and above the cut. By the time all this has been done, the middle of January has generally been reached. The date varies, of course, with the season.

The ice has now a thickness of from twelve to eighteen inches. Sometimes it is more than that; but this greater thickness is a disadvantage, because it renders the blocks of ice hard to bar off from the field. Now the field is carefully marked off, with a grooving machine drawn by a horse, into regular parallelograms,

which are generally twenty-two by thirty inches, the size which the individual blocks of ice are to be.

The ice field, unlike other fields, is cultivated before it is plowed. It is only now, when the marker has grooved the ice across and across,

that the ice plow is brought, or rather that several ice plows are brought, for several go over the same ground in succession.

A plow which cuts to a depth of six inches first follows the marker's grooves. Then comes another, which cuts two inches deeper, and then another, and so on until the trenches have been carried so deep that the blocks of ice may be barred off or loosened from the field.

Beginning at the outermost end of the canal, and working out at right angles with it as far as the field has been marked, the workmen break off, with a heavy wedge-shaped instrument called a bursting bar, sheets or sections of blocks of ice, making a new channel running off from the original canal. Through this channel the sheets of ice are forced, by means of hooks, to the main canal, and thence to the foot of the elevator which runs to the ice house.

At this point a narrow bridge of planks is thrown across the canal, upon which is posted a man armed with an iron bar. Standing with his face toward the shore, this man separates the sheets of ice into single blocks, with quick blows of his bar, as they float beneath him. With a quick push he thrusts each block over revolving chains upon the elevator. These chains are provided with lags or straight bars of wood, and the block is drawn up the inclined plane into the ice house by the continual movement of the elevator.

There is here an ingenious but very simple arrangement by means of which the blocks of ice are left at the proper place. At the level of the

floor of the ice house is a pocket or open space in the floor of the elevator, through which the ice passes. When it is desired to carry the cakes higher, the pocket or hole is closed with boards, and the ice intelligently keeps on to the next pocket above.

In the house the blocks of ice are placed close together on their sides, and left three or four inches apart at the ends, so that they will not freeze together with the melting and freezing to come.

The crop is harvested now; and if the iceman has had a fairly fortunate season, he has garnered at least a thousand tons to the acre. Not infrequently the crop reaches thirteen hundred tons to the acre.

The river is at its busiest in February, but the opening of navigation brings another busy season. All summer long schooners and barges, under tow, ply up and down, receiving their cargoes at the ice wharves. The blocks of ice are sent down the runway to the vessel's side, and there lowered into her hold.

Machinery is used here, too, as far as possible. A lowering winch is placed at the hatchway of

the vessel, and the ice is lowered by the aid of ropes and pulleys. The workers in the ice harvest are frequently farmers and their sons from the country lying back from the river. Often the ice workers are engaged in the sawmills in the summer season.

Thus a crop which costs nothing for seed, nothing for the ground to raise it upon, and nothing to fertilize, but a good deal to cultivate and still more to harvest, becomes a source of wealth to many and of profitable employment to many more.

J. E. Chamberlin.

CALIFORNIA RAISIN MAKING

Until within a few years all the raisins consumed in the United States were imported from Europe. It was supposed that they could not be produced in America because the climate was not warm enough and dry enough for a season of sufficient length for the purpose. But when, in 1849, American gold hunters invaded California, they not only found growing the largest and finest grapes they had ever seen, but also discovered that those left on the vines after ripening became raisins.

These raisins were not, however, of the best quality, for the vines on which they grew were such as the Franciscan fathers brought with them from Spain, a hundred years before, when sent among the native Indians who then lived on this Pacific coast.

Enterprising Americans, aided by foreigners from the wine and raisin-making countries of Europe, imported many varieties of the best

kinds of vines that could be found. Among these were the white Muscatels and Malagas, from which the best raisins are made.

The white grapes have flourished well, especially in southern California, where the long warm and dry seasons are favorable for making raisins. The entire absence of rain for the six continuous months, May to November, and an almost complete freedom from fogs or dews in many localities during the ripening and drying season, render this the most favorable climate in the world for producing raisins.

The grapevine here is not staked and tied up, in order to keep the fruit from the ground, as is done in the Middle and Eastern states. The cuttings begin to bear the second year after planting, and for several years they are allowed to trail on the ground, after being cut back each season, so that the fruit hangs very low. It is believed to ripen better on the dry, sandy soil than when suspended in the atmosphere, which is always cool at night.

As the roots grow older the main stalk of each is trained to a tree shape, twelve to thirty inches high, and in some old vineyards these stumps

have reached a diameter of from six to ten inches. The stumps are trimmed closely every winter or early spring, and from their tops new sprouts spring forth which bear the next crop of fruit. The yield of grapes is enormous, ranging from one ton to two or three tons an acre.

Very few vineyard owners manufacture their grapes into either wine or raisins. It requires more knowledge, skill, and capital to do either than the mere farmer generally possesses. But the raisin makers, like the wine makers, generally own and cultivate vineyards, of from one hundred to one thousand acres. There is one in Los Angeles County, covering five thousand acres, which is the largest in the world.

Several methods of drying grapes into raisins are practiced by the smaller cultivators. The following is the most popular and may be seen in operation at almost every country and village house in southern California. Some time in September or October small quantities of the finest Muscatel grapes are bought at one cent a pound. Some of the bunches weigh from two to five pounds, and are so large that they have to be cut in pieces to dry.

They are spread out as thinly as possible, no bunch on top of another, on some sunny porch floor, on the roof of a house or shed, or on trays made of laths or shakes, as the Californians call the redwood clapboards; these are placed upon trestles in the yard. Here the grapes lie in the hot sun all day long. After they begin to color and shrink they are generally covered at night with some kind of canvas.

In two or three weeks the bunches are carefully turned over and allowed to continue drying until they are thoroughly colored and all the juice has evaporated. Thus thousands upon thousands of families are now making their own raisins at a very small cost.

But now for the way in which raisins are made to sell. The grape grower, if he cultivates only eight or ten acres, can, with the aid of wife and children, gather his own fruit and haul it to the raisin maker; but if he is a man of means and manages his hundred or more acres, he hires a force of Chinamen, who with crooked pruning knives go through the vineyards, clip off all the ripe bunches of grapes, and place them carefully on shallow trays.

When filled these trays are gathered up and loaded into two-horse spring wagons, and hauled

Raisin Making

up many miles into level places among the foot-hills of the mountains to escape the danger of fogs, which often rise late in the season on the lower plains.

Here from fifty to one hundred acres of as level land as can be found have been scraped and rolled smooth. On these fields the grapes are spread upon the ground by drawing the bottom from each tray and letting them drop gently on their warm bed. They are thus emptied in successions of rows, hundreds of feet long and of uniform width, from dozens of wagons that come and go day after day from every direction.

Such grape fields resemble an immense carpet store where every imaginable pattern of goods is rolled out in the hope of pleasing some fastidious customer. The freshly laid rows present a light green shade of color, those that have been down a few weeks have a mottled appearance, while those that are nearly dry enough have a deeper and more uniform tint.

For the reason that the dry soil retains its warmth during the night, grapes dry more quickly on the ground than if elevated on boards, and they also more completely retain their flavor. In two weeks the smaller bunches are ready to be gathered up, and the larger bunches must be turned over so as to be dried on the under side. This drying requires two

weeks longer, when they also are taken up. Then follow the gleaners, women and children, who gather up all the loose berries that have fallen off. These are sold as dried grapes.

When the later crop is on the ground and the first showers are expected, raisin dryers bring upon the field great rolls of oiled Manila paper; and at night or when rain is threatened, this paper is spread upon the rows of grapes for the purpose of keeping them dry. This process is sometimes continued until late in December.

The dried grapes are put into boxes holding about a bushel and hauled to the packing house, where they are piled on top of one another as high as the ceiling or roof. In the course of eight or ten days the slight moisture left in some of them, and the heat, cause them to sweat, and this moisture so permeates the whole bulk as to give them a soft and fresh appearance. They are then ready for sorting and boxing. This is done by women and Chinamen, seated, forty or fifty in a room, at long tables.

To each is emptied as needed a box full of fruit; and beside each are placed two new, clean boxes, into one of which the largest and most

perfect bunches are packed. In the other box are placed the smaller and less perfect bunches. The loose raisins are passed through a windmill, and when cleaned of their stems and dust are boxed as "Loose Muscatels." Though most of them are the finest of the crop they sell for a much lower price than those adhering to the stems.

Three sizes of boxes are made, one to hold five pounds, another fifteen pounds, and the largest to hold twenty pounds. As the boxes are filled heaping full a careful inspector examines and weighs each, taking out any surplus, and passes them to the pressman, who puts on the lids and places them in the press, where they are gradually squeezed down and the lids nailed on.

They are then ready to be shipped to their Eastern and Northern markets by the carload, — about one thousand boxes to the car. But as they are not considered perishable goods, like oranges, lemons, and pears, they are not rushed off regardless of demand or prices. The consequence is that they have a steady as well as ready sale at prices which afford a very fair profit to the enterprising manufacturer.

Elias Longley.

A CROP OF CRANBERRIES

"THREE years ago that land was fit for nothing but to hold the world together," said a prosperous Cape Cod owner, surveying his cranberry marsh with pride, "and now it 's worth a thousand dollars an acre."

It does seem as if fairy tales had come true when unsightly bogs can thus be turned into gold, until one remembers that the means employed are the prosaic ones of time, labor, and capital. A marsh is selected in the neighborhood of running water, its tangle of bushes is burned, stumps and roots are removed, and the sods cut and turned over to give a uniform bottom of the rich underlying loam, which is afterwards covered with sand from two to six inches deep.

Each bog is then encircled by a low dike of earth, inside which is a ditch, and ditches are cut across it at distances governed by the character of the soil and its consequent demand for a greater or less amount of moisture. Then the

ground is ready for planting, and so hardy is the cranberry that this operation can be successfully performed in an apparently reckless manner.

A mass of plants is sometimes run through a hay-cutter, which chops them up in bits an inch long, and these are sown broadcast and harrowed into the soil like oats; yet after such heroic treatment they live and spread undauntedly.

The most approved method of planting, however, is that of marking off the ground into squares of eighteen inches, by drawing across it a sled having several runners. The cuttings are then dropped at the intersection of these lines and pressed into the earth with a forked stick.

All winter and until the early spring the cranberry meadows are flooded with water, not only to guard the plants against frost but also that insect eggs may be killed and the fertilizing agencies deposited which are brought by the stream.

Simply constructed gates of wood separate each diked inclosure from its neighbor, and by these the water supply can be exactly regulated. It is often necessary to raise the water in a

meadow while the berries are ripening, for the cranberry is only happy when its roots, imbedded in the rich, peaty soil, are kept moist, and the sand above is dry.

In its third year of growth a cranberry marsh is ready to begin paying for itself, and the picking season usually lasts from the middle of September for about six weeks.

This brings about an odd division of the school year in the cranberry districts. The summer term is lengthened and the spring vacation cut short, to enable the fall term to begin near the first of November. This is really a matter of necessity rather than of choice with the committee, for should the schools open, not a single pupil would appear except the smallest toddlers, whom the mother would gladly send out of the way that she might devote herself to cranberry picking.

Picking time is the carnival season at the Cape. The ordinary business of life is suspended. Houses are closed from early morning till night. Cooking is done in the evening or on rainy days, and beds are merely spread up in time for the tired workers to tumble into them. Flocks of pickers of all ages and sizes settle

upon the large cranberry marshes like swarms of locusts.

Even grandfather is eager to earn a little money to provide for his daily smoke in the chimney corner. Fathers and mothers of families depend on the season for supplying their everyday needs; and many a pretty girl who would scorn going out to work at any other time, gladly undertakes this back-breaking occupation for the sake of the pin money it brings.

Every picker dons his or her worst and sometimes most picturesque clothes for the occasion. Old hats and cape bonnets that have, perhaps, hung in the shed or garret the year round are seized upon as exactly the thing. Stocking legs are drawn over feminine arms as a defensive armor against sun and briers. Each picker is furnished with a measure holding six quarts, and the ground is marked off in rows, usually about four feet wide, by cords stretched from pegs.

Often these spaces are varied, as some of the best pickers prefer to work in a division alone; or a party of three girls, or mother and children, wish to pick together. A veteran picker is shown in the accompanying illustration.

Cranberries are not picked like strawberries, daintily and one by one. Experienced workers plunge both hands under the vines, palms upward and fingers curved, and literally scoop up the fruit by handfuls. A rake, which allows the vines to pass through its teeth and retains the berries, is also used, but is far less satisfactory than hand labor.

A Veteran

When a measure is filled and emptied the bookkeeper standing near gives the picker credit in his account, though tally is sometimes kept by means of tickets, each of which represents a measure and may be exchanged at the store for tea, sugar, or other commodities. The usual price paid is ten cents a measure, and the laborers, like those in other occupations, are sometimes discontented.

A few years ago a strike for higher wages occurred on a large marsh where there were five hundred pickers. Fifty of these, preferring a half-loaf to no bread, kept meekly on with their

work at the old price, and, sad to relate, the malcontents, perched comfortably on the dikes as a vantage ground, pelted them with a shower of sticks and stones. Harmony was finally restored and the strikers went back to work, but, as one old woman among them declared, they looked thereafter upon the fifty workers as poor-spirited creatures.

"Of course, as they work by the job, there is no chance of cheating," said a visitor to a shrewd proprietor.

He looked skeptical. "I tell you," he said, "cranberry pickers are just like all the rest of the world. Some wouldn't take a berry to save their lives, and others lie awake nights to think how to fill up their measures.

"Some will slyly take a new measure and dent in the bottom, and others have a way of giving the measures a shake so as to toss the berries up and make five quarts look like six. Human nature is mighty human on a cranberry bog!"

Berry picking has its champion workers, some of whom average over two hundred quarts a day, and there is a well-supported tradition that one nimble-fingered individual once distinguished

himself by picking three hundred and fifty quarts in that length of time.

Such workers show the concentration common to all champions. They seldom speak, but bend over the vines, giving their entire attention to the matter in hand. Even at noon, when the pickers sit about on the grass eating their dinners from baskets and pails, these more zealous

Picking Cranberries

members of the band are unwilling to spare the half or three quarters of an hour allotted to the meal, but seize a hasty bite and run back to work.

There are certain points of honor to be observed on the meadow, one of which relates to that operation known as picking under the lines. A crafty and overreaching worker may see and covet a goodly growth of berries on his neighbor's preserves; but though it be side by side with his

own, he may not, under penalty of remonstrance more forcible than pleasant, reach under for a sly handful. One such offense might be punished and forgiven, but a repetition of it would cause him to be ostracized by his fellows, who would ever after refuse to pick in his neighborhood.

The berries are screened, or separated from leaves and foreign substances, by means of a simple, box-shaped arrangement, presided over by women, or, with the more enterprising owners, by a clumsy-looking but most ingenious machine turned by a crank. The berries, poured in at the top, are winnowed by a blast of air, and as they fall on a glass surface below, the sound ones are separated from those which are imperfect. The good berries rebound, and hop upon a revolving belt, which carries them out of the machine, while the imperfect ones drop down into a receptacle prepared for them.

The perfect fruit is then placed in barrels of standard size, containing one hundred quarts, or in smaller crates, and sent away to market.

Frost-bitten berries have always been utilized for the making of marmalade, but it is only of late that they have also been used for dyeing.

Even one who has not seen the color produced can imagine how royally red it would be.

When cranberries are exported it would be interesting to know if they are often given a reception similar to that accorded by an English gentleman to a barrel sent him by a friend.

"The berries arrived safely," he wrote in return, "but they soured on the passage." The natural inference is that he had attempted to eat them with sugar and cream.

When we are told that a fair yield of cranberries consists of a hundred barrels to the acre, and that a fine quality of fruit always finds a ready market, we may understand a farmer's sinking all his capital in a marsh.

ALICE BROWN.

A MAPLE-SUGAR CAMP

In March the people in Vermont, and in other states where the sugar maple is grown, begin to look for what they call the sugar snow. While the ground is still white and the river is filled with broken ice, just as the winter is ending and the earth is relaxing from its frosty thraldom, the soft snow that comes helps the flow of sap; hence it is called the sugar snow, and is welcomed with much gladness and many preparations. Sugar snow and sugar time are among the most delightful experiences in the year to young people in the Green Mountains.

After the outbreak of the Civil War my father moved from a large town into Vermont, and I shall never forget the excitement which prevailed among us when he announced one day that work would then begin in the sugar place.

The first work in a sugar camp is to scatter the buckets. The farmer goes to each tree with his bit, and bores one, two, or three holes through

the bark. Into each hole he inserts a wooden or a galvanized-iron spout, through which the sap flows into the buckets suspended below it. Thirty years ago the buckets and spouts were all of wood, but they have been superseded by tin and galvanized iron, which are cleaner and more economical.

The work of tapping is not easy, as the snow is usually very deep when it is done. A large sugar place in Vermont, where a great amount of maple sugar is made, contains from one thousand to three thousand trees, and a place with less than three hundred trees is called a small one. If the weather is favorable, — that is, when the days are warm and the nights frosty, — the buckets attached to the trees first tapped are filled before the last ones have been bored, and their contents must be boiled at once. In a good season the flow is sometimes so copious that the men have to work night and day to prevent loss.

The sap is gathered by a man or boy, who goes to the buckets and empties them into large pails suspended from a sap yoke which he wears on his shoulders.

When there is a hard crust over the snow to hold him up, this work in the bright morning, with the bluest of skies above, is not unpleasant; but when the orchard is large and the snow deep and soft, and he has been toiling through the day and into the darkening night, attending to the steady drip, drip, drip in the overflowing buckets, he is apt to think that sugar time is not so jolly after all.

While the sap is being gathered the boiling must be kept up continuously. In the days of wooden spouts and buckets the sugar was made in a great iron caldron, suspended by chains over a fire in the open air. As the fire burned and the caldron bubbled, the winds made free contributions of dirt, twigs, sand, and smoke, which did not tend to improve the flavor of the sugar. Probably most of the sugar made in Vermont would hardly be marketable to-day if it were made in this way.

Now sugar houses are built, containing brick or stone arches, with sheet-iron pans, or evaporators, in which the sugar is boiled. Being kept from contact with anything which is not strictly clean, it is purer and of finer grain and lighter

color than it used to be. When the sap has been boiled until nearly all the water has passed out of it in the steam, it is strained and then rapidly boiled until it grains or hardens or changes from sirup to sugar.

The work of sugaring off in the old caldron made a red-letter day for the children. Provided

with a spoon and saucer, or a wooden paddle made especially for warm sugar, each boy and girl would set out for the sugar camp over snow-drifts much higher than their heads, and when the sugar was nearly done the fun began in good earnest.

Filling their saucers with the sugar the children repaired to the nearest clean snow and spread the sugar over it to cool before they ate it. There was more merriment than at any candy pulling, and it sometimes happened that all the farmer's family were encamped in the woods to help in the work.

When I went to the old schoolhouse of our district I was proud to find in my geography that Vermont produced more maple sugar than any other state in the Union.

Ruth Russ.

AMONG THE PINES

Maine has been very properly called the Pine Tree State, for it is in her almost exhaustless pine forests that she finds one of her sources of wealth and commercial importance. Although

spruce and hemlock have been gradually taking the place of the pine in the lumber trade, there are still vast unexplored tracts stretching far away toward Canada, where this noble tree flourishes in all its old-time grandeur and luxuriance.

Early in the fall, sometimes by the first or middle of October, the advance guards of the

lumber crews, each consisting of some half a dozen men, start for the forests where their employers' claims are situated. They select a place as near as possible to one of the small streams that thread this vast lumber region in every direction, and build the camp which is to serve them and their comrades for a shelter during the long, cold winter that is at hand.

A hut, proportioned to the size of the crew that is to occupy it, is built of large logs, carefully notched and fitted at the corners and chinked with moss and clay. A stone fireplace is built in one corner, and bunks for the men are placed against the wall and filled with the fragrant tips of pine boughs to serve as beds.

The roof is made of long, split shingles, fastened down with long poles instead of being nailed, and finally covered with spruce boughs, which, after the first fall of snow, keep out the wind and frosts very effectually. The earlier camps used to have only the hard-trodden earth for floors, and were without such conveniences as tables, plates, etc., but now there are plank floors, and a table with a suitable supply of crockery is in most cases provided as part of the woodman's necessary outfit.

Near the hut of the loggers another is constructed with much care, to make it as comfortable as possible for the dumb companions of their winter's toil, the patient, plodding oxen or the quicker horses. By the time everything is ready for their reception the men and cattle make their appearance with the supply of food that is to serve them all during the winter. Flour, pork, beans, molasses, and tea are the staples. Sometimes a barrel of corned beef finds its way into the camp, but as a rule the diet of the men consists of hot flour bread, with pork fat for a relish, and tea without milk, sweetened with molasses. These, with the indispensable dish of baked beans, cooked to perfection in a hole dug in the earth and lined with hot stones, form luxurious fare to appetites sharpened by hard work in the cold, frosty air of midwinter.

Sometimes a lucky shot may bring down a moose, or an equally lucky find may put them in possession of enough bear meat to make every day a feast day for a week or two. The fat of the bear is said to be very delicate, and is much prized by hunters and lumbermen. In it they fry their favorite dainty, the Yankee doughnut.

A crew is generally directed by a boss, who takes the charge of affairs, allots the work, and sees that it is faithfully performed by the choppers, swampers, teamster, and cook.

The boss decides upon the best place to commence operations, and then all hands clear a road from that spot to the stream, so that when the snow comes there will be a comparatively smooth and level roadway for the teams to drag their ponderous loads over during the winter.

Commencing his work with the earliest gleams of daylight, the sturdy, strong-armed chopper plies his ax, stopping only for a hasty dinner at twelve, until the ghostly shadows of twilight fall upon him from between the dusky tree trunks, and the evening star, far above in the blue wintry sky, seems resting like a glowing gem upon the topmost spire of the giant pine above his head.

Then the weary worker turns his steps campward, where a blazing fire and a hot supper soon make him forget the cold and fatigue of the day; while in the companionship of his mates he finds the mental stimulus that binds him to the half-forgotten world outside his own forest solitudes.

Besides the hard work there is always more or less danger in felling these mighty trees. The experienced chopper can easily detect by the

A Camp in Winter

motion of the swaying trunk in what direction it is about to fall, and he makes his retreat accordingly; but as the enormous branches go crashing down through the tops of the smaller trees,

they are often broken and hurled through the air, crushing whatever lies in their track, occasionally wounding and sometimes killing the luckless chopper, whose skill in woodcraft proved insufficient to shield him from this unexpected danger.

The tallest trees are usually sawed at the landing into logs of a convenient length for the drive, which begins as soon as the spring sun has acquired power to melt the immense masses of snow and ice that cover the hillsides. Then every little brook is swelled to a raging torrent, into whose eager embrace the logs are hurried, and the perilous and exciting work of the river driver begins.

From lakes and tributary streams the logs are soon driven into the main river, where they become indistinguishable in the mass called the main drive. The different crews now vie with one another in deeds of agility and daring, and it is wonderful to note the skill and promptness with which these men, scorning danger and discomfort, manage to keep millions of rolling logs in the main channel of the river. The task is far from being an easy one.

Without a dry thread of clothing for many days and nights in succession, the river driver knows neither rest by day nor ease by night. Sometimes the boat containing the supplies fails to reach the stopping place for the night in advance of the crew, and then the poor fellows, cold and wet as they are, must lie down hungry and shelterless upon the bare ground, to snatch such rest as they may find in their uncomfortable quarters.

With the soles of his boots armed with sharp spikes to keep him from slipping, and a setting pole, with which to guide the logs and steady his own steps, the river driver considers himself fairly equipped for the toils and dangers awaiting him.

In a narrow channel between high banks, or at the head of a fall, the logs are likely to form what is called a jam; that is, one or more logs chance to strike across the stream in such a way as to obstruct the passage, so that those pressing on behind, unable to pass, are piled high one above another in the most inextricable confusion.

To break one of these jams is a difficult and almost always a dangerous task, as the operator must in many cases cut away with his ax one or more of the obstructing logs, thus letting the

whole mighty mass loose in an instant, and giving him little time to escape from the terrible onslaught.

Sometimes, when the banks are high and the channel is very narrow, it is necessary to let a man down from the top by a rope to perform the dangerous task; and if he escapes with only a few bruises and scratches, he may consider himself fortunate, since the parting of the rope, or the failure of his comrades to draw him up at the very instant that the jam starts, might be death swift and sure, without any possibility of rescue.

When at length the logs reach their destination they are inclosed in a boom. This is simply a floating fence of large logs, fastened together so strongly that their wild brethren, fresh from the forests, cannot escape from their restraining arms.

And now it is the duty of the boom master to see that each owner has his own logs assigned to him fairly and justly. Every man's logs are marked by some kind of hieroglyphic cut deep into each log by the ax of the loader. If any log, either by carelessness or accident, has reached the boom unmarked, it becomes the property of the

boom master, who is also entitled to a certain proportion of the lumber as his share for the care and labor of harborage and distribution of the whole.

It seems a tame ending to all this wild turmoil, this dumb exhibition of unloosened savagery, to see the poor logs at last floating meekly down to the sawmills, where

> Steam, the slave, shall tear them with his teeth of steel,

and carve them into plain, commonplace boards and staves, which shall, in time, lose even the fragrant breath that alone reminds one of their forest origin.

Mrs. H. G. Rowe.

HOW MATCHES ARE MADE

Many who are yet living recall the difficulties, the cut and bruised knuckles, the words of vexation that were, fifty years ago, incident to attempts to get fire from tinder box, flint, and steel, so that a flame might be kindled on the hearth. Often the attempt failed, and the housekeeper was forced to borrow from the nearest kitchen a pan of live coals, or a blazing brand, kept alight during the return journey by violent twirling to and fro.

In those days, one hearth fire in every house, usually in the kitchen, was constantly maintained, unless accident or neglect quenched it. The fire kindled by a young couple at their marriage burned brightly throughout their lives, and perhaps throughout the lives of their children and grandchildren.

The burning glass was in general use among smokers, a cloudy day being woeful to them, since then they were dependent for a light upon the

favor of some passing stranger, or the good graces of the nearest housewife.

A hundred and fifty years before the invention of the match, phosphorus was discovered and the principles of the present splinter were stumbled upon by an obscure chemist, who found that friction of the new substance between rough surfaces — two pieces of brown parcel paper, for instance — kindled a flame that would ignite any combustible substance, or even a stick, provided it had previously been dipped in sulphur or fat. Strange to say, this was regarded merely as an interesting chemical experiment.

In the early part of the present century it was found that potassium chlorate, in combination with loaf sugar, kindled when brought into contact with sulphuric acid. The fact was at once seized upon, and handsome metal cases soon made their appearance, at the price of one guinea, or about five dollars. These contained one hundred sugar-and-potash-tipped splints, as well as a phial holding ground asbestos saturated with sulphuric acid.

But the device quickly fell into disrepute, less because of the price, which was ultimately reduced

one half, than on account of the affinity of the acid for water. It absorbed moisture from the atmosphere in such quantities as speedily to render the apparatus useless. Later it was suggested that if phosphorus were heated in a phial until an oxide formed within upon the glass, and a sulphur-tipped splint were dipped therein, it would ignite on again coming in contact with the outer atmosphere. The cost of phosphorus prevented this device from becoming useful.

In 1827 one John Walker, a chemist of Stockton-upon-Tees, England, invented the first "lucifer" or friction match. It consisted of a splinter dipped in a compound of antimony sulphate and potassium chlorate, which was ignited by compressing between two pieces of sandpaper. This proved objectionable, because the heads were likely to fly off without igniting the wood.

A little later phosphorus was substituted for antimony, producing what was known as the "Congreve," so called in honor of the inventor of the Congreve rocket. Gradually the composition was improved, other constituents taking the place of the potash, until the perfect match was developed.

To-day phosphorus is the chief ingredient of the tips of all friction matches; it alone secures combustion. The sulphur is added only to insure a sufficient continuance of the flame to ignite the wood thoroughly.

The peculiarity of each variety of matches is confined solely to the preparation of the tips. From one eighth to one twelfth of the tip is red lead, niter, or some other substance that will secure a proper amount of oxygen to feed the flame. The remainder of the tip is phosphorus, and gum or glue to secure the fluidity essential to adhesiveness and convenience of manipulation.

Match splints may be made from almost any light wood. Birch is preferred in Europe and the maritime provinces of Canada; white pine is preferred in the United States. One manufacturer consumes annually not less than one and a half million feet of the choicest white pine, free from knots or flaws, representing a money value of about eighty thousand dollars.

Formerly match splints were cut by a knife that rose and fell with every revolution of a crank, — a miniature guillotine, — the block of wood moving forward with each stroke just the

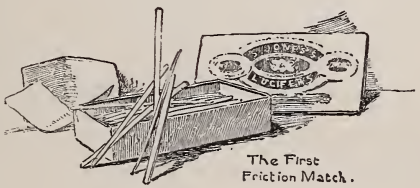
thickness of the match. This machine required the block to be first boiled in order that the knife might cut it almost through without splitting it, thus leaving the splinter so slightly adherent as to be readily broken off by the fingers. The block had to be cut twice over, the second gashes at right angles to the first; the dipping and finishing had to be done by hand.

By the modern process the wood is sawed into blocks two inches square, which are fed to machines that instantly reduce them to shapely match splints. As fast as the splints drop from the knife they fall in regular order upon an endless belt which carries them to the dipping trough. If a round match is desired, they are first forced through dies to give them the required form.

In the dipping trough their ends are brought in contact with a wheel brush revolving in melted sulphur. Passing on, they reach a second trough where the phosphorous mixture that provides the tip is in like manner applied. Without pausing they move on to the drying room. After circling about this a few times they pass into a contiguous apartment to machines that automatically count and pack in strawboard boxes.

Formerly the manufacture of matches was a dangerous occupation because of the fumes, which, coming in contact with the decayed teeth of the workmen, induced horrible diseases of the jaw. This has been wholly obviated: first, by the introduction of automatic machinery that applies the tip and frees workmen from the need to lean over the trough to dip the splint; second, by the substitution of red, or so-called amorphous phosphorus, for the cheaper and more primitive form.

From red phosphorus also are manufactured the so-called "safety matches," a phrase which is not always strictly accurate. It is popularly supposed that they can be ignited on a specially prepared surface only. In fact, although they do not ignite upon friction with rough surfaces, some of those



which are sold as "safeties" may be kindled by a short, quick stroke on a smooth or highly polished surface, such as a windowpane or a piano top.

The theory of the safety match is to separate the phosphorus and the chlorate, which are united in the head of the ordinary match. The dipping mixture for the match is of potassium chlorate or nitrate, antimony sulphide, and glue. This match will not kindle unless it is rubbed against a surface containing phosphorus. But some manufacturers put a small quantity of phosphorus into the match itself, and then it is not a safety match.

In the "parlor match" it is the potassium chlorate which causes the explosive detonation. A less noisy compound is potassium nitrate. It is more costly than the sulphur match, and no better, unless one objects to the smell of brimstone.

Wax matches, or "vestas," are no longer produced in the United States, partly because of the expense, and partly because the demand is smaller; but abroad they are much used. They are odorless, give a fine light, and offer a happy substitute for candle or lamp where but a brief illumination is required. Composed of strands of cotton dipped in melted wax, or paraffin, they are molded by being

drawn through dies of the proper size. Subsequently they are cut to match lengths, and tipped with a phosphorous mixture in the same way as wooden splints.

The Japanese produce a variety of peculiar matches, some of which are made of paper. One

form burns with an evenly luminous flame creating, as combustion advances, a red-hot ball of glowing saline matter.

Another form, when half-consumed, emits a series of bright sparks, producing scintillation so

brilliant as to rival that of steel burning in an atmosphere of oxygen. These, I believe, are derived from varying combinations of charcoal, sulphur, saltpeter, and phosphorus, the proportions being known only to those who are engaged in their production.

There are upward of one hundred and fifty manufacturers of matches in the United States alone, and perhaps one half as many in Canada. It has been computed that an average of eight splints is required to supply the daily needs of each individual, great and small, throughout the civilized world. In other words, three millions of matches are ignited for each minute of time throughout the twenty-four hours! Yet matches are almost unknown in many parts of Europe,— especially in the remote regions of the Austrian, Russian, and Ottoman dominions, where the brazier of live coals is in universal use.

G. A. Stockwell.

HOW SOAP IS MADE

The origin of soap is a mystery, but we have many evidences of its antiquity. Under the name of *borith* it is mentioned at least twice in the Bible at a period corresponding to several centuries before Christ.

In the Louvre in Paris there is an interesting old vase of Etruscan manufacture, the age of which is computed at about twenty-five hundred years. It is interesting in connection with our subject as bearing in relief a group of children who are engaged in blowing bubbles from pipes. Though we must not overlook the fact that certain vegetable juices are capable of being used in blowing bubbles, it is for many reasons more probable that soap of artificial manufacture was employed for the purpose.

In the unearthed city of Pompeii, the preservation of which has been the means of revealing to us many antique customs, there is to be seen a soap manufactory, with all the kettles and other

paraphernalia pertaining to the business; also a quantity of soap, evidently the product of these antique soap works.

I had the good fortune, when visiting Pompeii, to obtain not only some of this ancient soap, but also some peculiar white clay of a highly saponaceous character and possessing remarkable detergent properties. It was taken from the bottom of a well sunk inside the soap factory — the spring, no doubt, from which the Pompeian soap manufacturer obtained the water which he used in making his soap.

Political economists tell us that the quantity of soap consumed by a nation is a gauge of its state of civilization; and in this connection it is interesting to observe that the country in which soap manufacture was first conducted as a commercial enterprise is far behind others to-day as a soap-making or soap-consuming community.

The English manufacture the largest quantity of soap in proportion to the population, the output being a little over one pound a week for each person, while in America it is just a little under that figure. But we must not concede that this indicates a higher civilization in England than in

America. Great Britain not only consumes more soap than America does in various manufactures, but she exports a great deal of her product, some of which is used by the people of the United States. Germany follows next; then France, then Holland, — while Italy takes a poor sixth place.

The United States can boast the largest and most perfectly equipped soap factories in the world. Some of them have a capacity of more than three million pounds a week — a striking contrast to the little establishment at Pompeii, which, though perfect in its equipment, had scarcely a capacity of as many grains, equivalent to about four hundred pounds.

Of all the soaps which are now or have ever been manufactured, those made from olive oil are the best. It is not surprising that the olive-growing countries of southern Europe should have acquired such a great and world-wide reputation as soap-producing regions, for their natural advantages for such an industry are great.

On the one hand their climate and the fertility of their soil fitted them well for the cultivation of the olive, and on the other the immense supply of seaweed, from the ashes of which they

prepared their caustic lyes, gave them an advantage over the rest of the world.

However, through the discovery of a means of producing caustic soda in unlimited quantity from our enormous salt deposits and even from the ocean itself, soap making has ceased to be a local industry.

At the present time the alkali plains of the United States promise to become an important center for this industry; for there in nature is to be found a large quantity of alkali which can be had for the trouble of taking it from the soil. It is now being used in converting into soap the tallow and grease from the large herds of live stock raised on the adjoining plains.

In its essentials the process of manufacturing soap has scarcely changed since the time of the Pompeians. The large factories use the same methods that were employed in Pompeii eighteen or more centuries ago; and the process is so simple that the farmer, or more frequently his wife, can and often does make the household soap.

The simple boiling of a quickened lye with grease or oil, and the subsequent addition of salt to separate the excess of water and glycerine,

which would make the soap too soft were they not removed, constitute the process. Grease and oils used in soap making contain glycerine, and soap making consists in boiling the fat long enough, and with sufficient caustic lye, to separate all the glycerine from the fat. Formerly it was the habit of the soap maker to throw away all the waste lyes which contained this glycerine; and in this way an enormous value in material must have been wasted. To-day nearly every soap factory also makes glycerine, and this is a very important and profitable branch of the business. This is as much a triumph of modern chemistry as is the method of obtaining caustic soda from common salt.

Chemistry has also shown us from what an enormous variety of sources the fatty matters used in soap making may be obtained. Every fish and animal, every fruit, flower, and plant, yields its characteristic oil. It has even been proposed to utilize the seventeen-year locust for this purpose, as a large proportion of his body consists of oil. The chrysalides of the silkworm, of which many tons are produced yearly, have long been utilized as soap stock, both in Italy and in China.

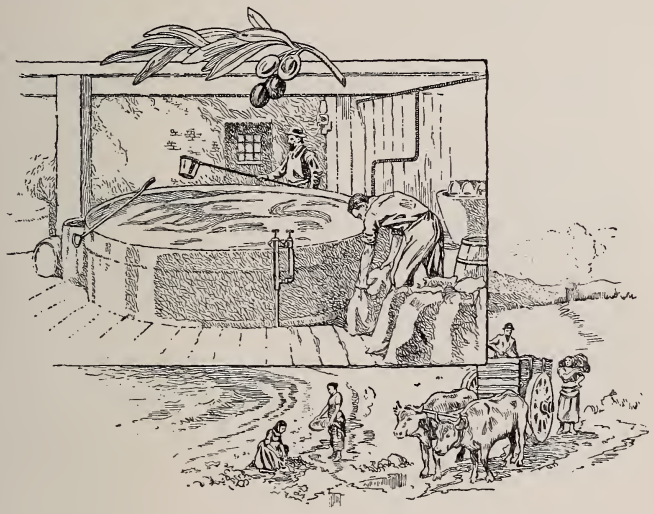
One of the greatest problems in modern chemistry is to convert the oils of crude petroleum into a soap-making material. It has already been vainly attacked by many eminent chemists, and numerous experiments have been made. It is doubtful if the problem will be solved for many years.

Although the process of making soap is very simple, like anything else it may be done in a slipshod manner. Many badly made soaps contain a great deal of free alkali, the effect of which is to destroy linen, cotton, and other fabrics, while upon the skin it acts as a cautery, causing sometimes very painful sores and irritation.

A soap may be tested for free alkali by cutting a piece and holding the tip of the tongue for a few moments in contact with the freshly cut surface. If free alkali be present the soap will cause a biting sensation. If any considerable excess of free alkali can be detected, the soap should not be used.

Of course the use of strongly alkaline soaps for cleaning woodwork, and even for washing clothes, is not so harmful as is its use for toilet purposes.

Toilet soaps, some of them of excellent quality, are sold in the form of powder. The test for them is the same as for hard soap.



There are now so many makers of good soap, both in America and in Europe, that there is no reason why any one should be satisfied with cheap and useless soaps. In reality these soaps advertise themselves as a poor article by not bearing the name of a reputable manufacturer.

PETER H. WALSH.

HOW PINS ARE MADE

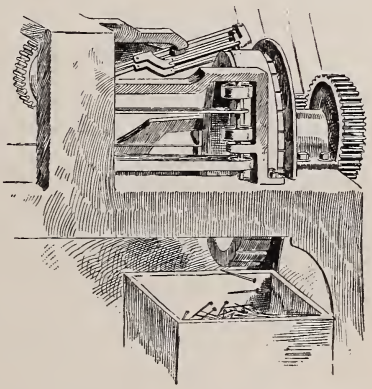
METAL pins were made by hand in the sixteenth century. Before that time small skewers of ivory or wood were used, just as the negroes in the country districts of the South use the long thorns of the haw tree to-day.

The first metal pins were probably made of gold, because in England they were considered such an extravagant luxury that the makers were not allowed to sell them publicly except on two days of the year. Then it became the custom, at the beginning of each year, for husbands to give their wives money to buy a few pins. To this day, for this reason, money allowed to a woman for her private spending is called "pin money."

Many packages of pins may be bought now for the amount asked for a single pin in those days; yet each one of these little articles — so cheap that the least coin in any civilized country is large enough to buy many of them — requires

very expensive machinery and the attention of several men and women to make it.

The process of making the wire from which the pins are manufactured is of itself slow and complex, but it is not considered in pin making, because the wire is made by one manufacturer and sold by him to another who makes the pins. This wire comes in coils of great length, and is just the size of the body of the pin.



It is first drawn between six or eight little rollers, to press all the bends and kinks out of it. The machine which does this also winds the wire carefully on a large reel; and this reel is placed on a spindle attached to the machine which makes the pins.

When a reel is put on the spindle a workman inserts the free end of the wire between two steel rollers, which draw it in and feed it properly to the cutters. After this it continues to feed itself. As the wire leaves the rollers it passes between

two matched dies until it touches a gauge. Just as it does this the dies come together and clamp it firmly in a groove in their face. At the same time the machine cuts it off the proper length. The gauge then moves away, and a little punch forms the head by striking the end which rested against the gauge.

When this is finished the dies separate and deliver the pin into one of a great many grooves in the face of a wheel about a foot in diameter, and just as wide across its face as the pin is long.

As soon as the first pin leaves the dies, the feed rollers send the wire between them again, and the whole operation is repeated.

When the pin is taken by the wheel it has no point; but as the wheel turns it rubs the pins against an outside band, which causes each one to roll in its groove, and at the same time carries them past a set of rapidly moving files, which rub against the blunt ends and sharpen them roughly.

They next pass against the faces of two grinding wheels, which smooth the points, and then to a rapidly moving leather band having fine emery glued on its face. This gives them the final polish; and as they leave the band they are

dropped into a box underneath the machine. This machine works so rapidly that it makes seven thousand five hundred pins an hour.

After this the pins are plated with tin to give them a bright, silvery appearance. They are prepared for plating by being first immersed in weak sulphuric acid, to remove all grease, and then dried by being placed — a bushel or so at a time, with about the same quantity of sawdust — in a machine called a tumbling barrel. This is simply a cask suspended on a shaft, which passes through it lengthwise. The shaft is made to turn by means of a belt, and in doing this it revolves the barrel. Two or three hours rolling in this sawdust cleans the pins and wears away any little roughness which the machine may have caused.

Pins and sawdust are taken together from the barrel and allowed to fall in a steady stream through a blast of air. As the sawdust is lighter, it is blown over into a large, room-like box, while the pins, being heavier, fall into a bin below.

After this they are spread out in trays having sheets of zinc in their bottoms, which have been previously connected with one of the wires of an electric battery. The trays are then placed in a tank containing a solution of tin in muriatic acid, and the other wire of the battery is inserted in the solution. Electrical action immediately begins and deposits metallic tin on the entire surface of each pin.

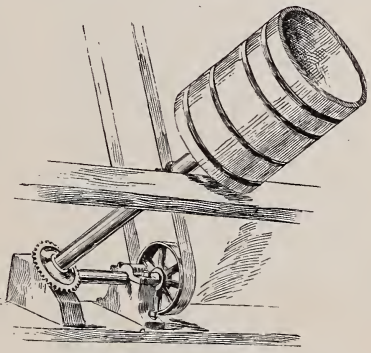
They are then washed in a tank of water and put into other tumbling barrels with hot sawdust. When they have been dried and cleansed, as in the former instance, they are put into a large, slowly-revolving copper-lined tub, which is tilted at an angle of about forty-five degrees. As this revolves the pins keep sliding down the smooth copper to the lower side. This constant rubbing against the tub and against one another polishes them.

It was formerly the practice to allow pins of all lengths to become mixed in the different operations, and after polishing to separate them by a very ingenious machine; but it has been found more economical to keep each size by itself.

From the polishing tub the pins are carried to the "sticker," where they fall from a hopper on

an inclined plane in which are a number of slits. The pins catch in these slits and, hanging by their heads, slide down the incline to the apparatus which inserts them in the paper.

By an ingenious device a pin is taken from each slit, and all the pins are inserted at once in the two ridges which have been crimped in the paper by a wheel that holds it in place. While this wheel crimps the paper it also spaces the rows, so that when filled with pins the paper will fold up properly.



This whole machine is so delicate in its action that a single bent or imperfect pin will cause the machine to stop feeding; yet its operation is so rapid that one machine will stick ninety thousand pins an hour.

As the long strip of paper on which the pins are stuck comes from the machine it is cut into proper lengths by girls, who then fold and pack the papers in bundles ready for shipment.

HARRY PLATT.

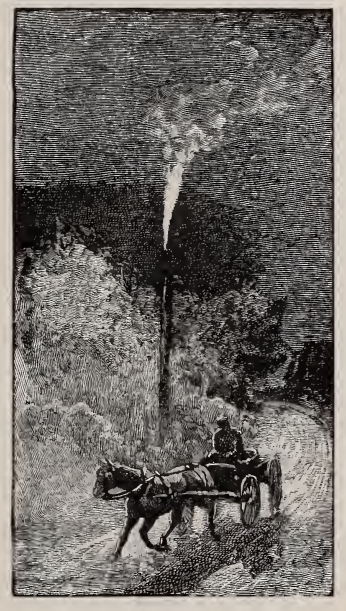
THE USE OF NATURAL GAS

The earliest Jesuit explorers of the Ohio Valley discovered and reported columns of fire issuing from the ground. In 1775 George Washington sought to have set apart and reserved to the public forever a square mile of land in the Kanawha Valley, in the center of which was a burning gas spring which he regarded as one of the greatest of our national wonders.

The first use of natural gas for domestic purposes in America was made in 1821 in the village of Fredonia, Chautauqua County, New York, where enough of it was collected and piped to supply thirty burners. The village inn was illuminated by this gas when Lafayette passed through Fredonia in 1824. At the same time a small lighthouse on Lake Erie warned vessels from the coast with a flame of the same product.

Natural gas is found in connection with petroleum and salt-water deposits, and it was the gas that rushed from a salt well, bored in western

Virginia in 1841, that was first used as fuel in a furnace. Here it supplied the heat necessary for boiling and evaporating the salt water, and enabled the owners of the well to make salt a little cheaper than other well owners.



Gas Light

From the earliest development of the Pennsylvania oil fields a portion of the gas that generally accompanies the flow of oil from a well has been used to heat the boilers of the pumping engines, and to warm and light the dwellings in their vicinity. For many years, however, it was oil which the drillers were seeking, and they allowed millions of cubic feet of gas to escape or burn to waste daily, with little thought of its value. If it was lighted at the ends of tall pipes for the illumination of village streets or dark forest roads, no one thought of turning it off at sunrise.

In 1874 it was discovered that this fuel could be used more effectively and cheaply than coal in iron works, glass works, and other manufacturing establishments. It was not until 1883, however, that the enormous volumes of gas supplied by the Murraysville field were directed through twenty miles of iron pipe to Pittsburg, and offered as fuel for the mills, factories, and dwellings of that city.

With its use for this purpose the manufacturing business of that large city was revolutionized, its domestic comfort was greatly increased, and its whole aspect was changed. Gas not only furnishes a more regular and intense heat than coal, but furnishes it at a reduced cost, and does away with the labor of handling coal, building fires, keeping them supplied with fuel, and disposing of the accumulated ashes and cinders.

It was not found necessary to make any material change in the construction of furnaces, open grates, or stoves. Those built for coal are still used for gas. The only difference is that, instead of kindlings, coal, ashes, cinders, soot, and smoke, there is a small pipe that issues from the floor and enters the grate. A stopcock is turned, the gas is ignited, and any degree of heat required can be

obtained at once and regulated at will. When no longer needed the flame is instantly extinguished and all care of the fire is at an end. With a good draught there is perfect combustion and no odor.

Natural gas is found in both sandstone and limestone formations, at depths ranging from a few hundred to two thousand feet, and is reached by wells bored in the same way as for oil. In fact, it often happens that a well sunk for oil yields gas instead. This was formerly regarded as a misfortune, but the gas has become as valuable as the oil, and drilling for gas is a well-established business.

Striking gas is a somewhat thrilling affair. As the ponderous drill crashes through the thin remaining crust of slate, and liberates the giant imprisoned for ages beneath, the column of gas leaps up the five-inch pipe with such force as violently to project the heavy boring tools, weighing a ton or more, through the derrick frame. The gas, with a screaming roar, springs a hundred feet into the air, a column of bluish vapor. Sometimes it tears the casing of cast-iron pipe from the well, and hurls after it volleys of earth and rock, mingled with jets of oil and salt water.

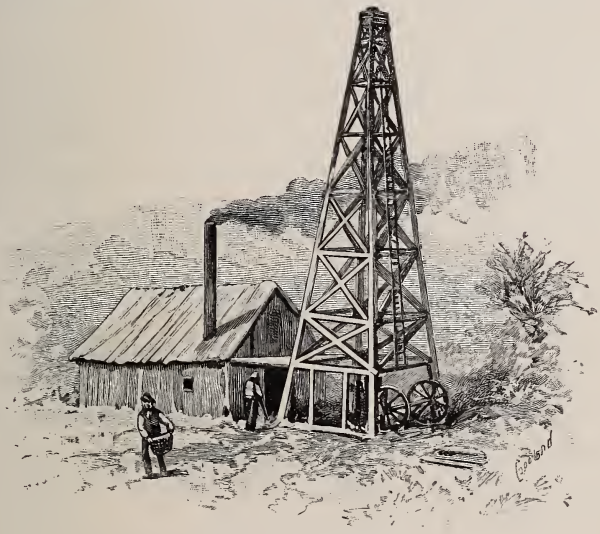
Of course not all gas wells begin business in this boisterous manner. Most of them are of comparatively gentle flow and easy to manage, though such scenes as the one described are not uncommon in new fields.

The gas giant is fond of fire, and the moment he is loosed from his underground prison he begins eagerly to search for it. If it is found under the boiler of the pumping engine, in the bowl of a workman's pipe, or in sparks struck from flinty rocks, the pillar of vapor instantly becomes a column of flame, throwing out an intense heat, devouring and withering everything in its vicinity, and at night lighting miles of the surrounding country with its angry glow. It may burn for weeks, months, or even for years, before its terrible strength is so exhausted that the torrent of flame can be extinguished and its energies subdued to the service of man.

During the past forty years the quantity of gas thus wasted has been enormous beyond belief or power to compute. But this waste is now almost wholly checked. Devices have been perfected and adopted for seizing and controlling the vapor upon its first appearance in the well, and before

it has drawn a single breath of air, without which its ignition is impossible.

Even the vast columns of flame that so long baffled the efforts of the gas men can now be



Drilling a Gas Well

extinguished, so that the gushers and roarers of new gas fields, with their pressure of four or five hundred pounds to the square inch, are conducted through a network of pipe lines to the scenes of their future usefulness without loss of time or money.

A singular spectacle was afforded by a well bored at Gambier, Ohio. The well, not having been tubed, repeatedly filled with water, which was ejected by the rush of gas at regular intervals of one minute. An intermittent fountain of mingled gas and water one hundred and twenty feet high was thus formed. In winter the derrick above the well became so completely incased in ice as to form a transparent chimney. By cutting a hole at the base of this ice chimney, and igniting the gas as it rushed upward, an effect was produced that at night was weird and beautiful beyond description.

Another fascinating picture is made by the miniature aurora borealis that appears in the vicinity of blazing gas wells on clear, cold winter nights, when the air is charged with minute ice crystals. The darkness glows and sparkles with broad bands, streamers, and brilliant points of light reflected from the innumerable tiny frost diamonds that dart to and fro, waver, disappear, and flash into brightness again in a most bewildering manner.

The reservoirs of natural gas were once thought to be inexhaustible. It was even maintained that

the gas is produced in the underground laboratories faster than it can be used. This view is not now held. Wells have been exhausted and have ceased to flow, and often the supply from a new one is diminished as soon as another is sunk in its vicinity. However, no community which has once enjoyed the blessings of a gas fuel will willingly return to the use of coal.

Gas has become almost a necessity, and human ingenuity is now at work in a thousand directions to invent methods for producing it cheaply and abundantly from coal or other materials in order that, when the natural supply is exhausted, an equally good artificial supply may take its place. Communities which cannot obtain natural gas are already demanding an artificial product that shall give them equal advantages with localities supplied by nature with this perfect fuel.

Gas stored in portable tanks is being used as fuel beneath the boilers of locomotives and steamboat engines, and indications point to its substitution for coal on a still wider scale than at present.

KIRK MUNROE.

ADOBE AND ITS USES

I HAVE frequently watched the making of adobes by the natives of New Mexico. Adobes are sun-dried bricks about twelve inches long, eight wide, and two deep. They are used in place of kiln-seasoned bricks and stone, and for many purposes for which lumber is used in a wooded section. Fences, for instance, are largely made of adobes; corrals, gardens, orchards, yards, churches, schools, and convents are inclosed by walls built of adobes.

These mud walls are often seen with cacti planted thickly on their tops, as a double security against thieves and other trespassers. When cacti are not easily procurable, the walls are defended by broken glass bottles imbedded in the top round of bricks before they are thoroughly dry.

On lines where protection is not called for I have seen the tops of these fences picturesquely ornamented with bright flowering plants, such as scarlet and yellow cacti, the wild sunflower, the Spanish bayonet, and the Mexican lily.

When a house is to be built, an addition to be made to one, an oven or a fireplace to be shaped, or a piece of ground to be inclosed, the enterprising Mexican assembles his helpers as at a primitive

Making Adobe

house-raising. The first move is to spade up a patch of ground, often a portion of his own front yard. Sometimes, as an act of friendliness, the adobe maker gets permission to spade up a neighbor's yard or a vacant lot near the building site.

The ground being well broken, water is brought on and the mixing is begun. As the surface before the breaking was in all probability but carelessly swept, many bits not essential to good bricks get mixed in the mud, — bits of glass, stone, pottery, tin, wire, chips, rags, etc. But it is not in the purpose of the adobe makers to use other materials than water and the soil everywhere found.

There is a little preliminary mixing with hoe and spade, but shortly the workers strip to the waist, bare the feet, roll above the knees whatever there may be of trousers legs, and walk bravely into the mud. Standing in the brown mixture of precisely his own color, the expressionless, statuesque Mexican might by an easy reach of fancy be regarded as an outgrowth of the adobe mud. Then hands and feet reënforce spade and hoe until the mixing is complete.

Rough wooden molds are now filled with the mud and scraped level by the hands. The molds are carried away a short distance and the molded mud is tipped out on the ground.

There the adobes lie for days or weeks, sunning, while the owners are sunning themselves

against adobe walls centuries old, it may be. There is no fear that the blocks will be spoiled by rain in this white and bright land where the sun shines three hundred and sixty-five days in the year.

The mud bricks being sufficiently baked on one side, they are turned over, and in time on edge, until both sides and edges have had the effect of a sufficient period of direct sunshine.

An Eastern brickmaker would regard these adobe bricks as rough, uneven, and unsightly. But they have their merits. Their making does not call for any skilled labor; they can be made in a day, dried without expense, and can be laid by inexperienced hands. They form such inexpensive building material that the poorest man can have his own house. I have seen many a comfortable adobe house of four rooms, well plastered inside and outside, erected at a cost of five hundred dollars.

I choose the adjective "comfortable" advisedly. Without the shelter of a tree, in a land of perennial sunshine, an adobe house furnishes a complete protection from summer heat, however high the mercury may be. The earth walls never get

heated through in such a climate as New Mexico's; neither do they ever get chilled through. In the shelter of an adobe house you can forget that there is winter cold or summer heat.

The Mexican peasant builds an unpretentious lodge, but for comfort it will stand comparison with the peasant house of any land. He lays the adobes on the bare earth, builds up two or three feet, then waits some days to insure the dryness of the walls, builds a few more feet, and again waits. When his wall has reached a height of ten or twelve feet he stops. Then he lays on the beams or rafters, usually of the unbarked trunks of piñon trees not fully grown. The piñon is the mountain pine of the nut-bearing variety.

The rafters are not of uniform length. Some project a foot over the wall, others more than a yard, furnishing a place for drying plants, or for the storing of hay, or for the roosting of Mexican boys ambitious enough to climb to the roof.

These rafters are the support for the thick planks or boards laid closely across, which are to receive the dry adobe dirt. This is piled on to the thickness of about thirty inches. It makes a dry, warm roof, on which, in the course of time,

chance seeds take root, causing a little forest of plants to spring up on the low roofs.

The dirt roofs are safe so long as the timbers are sound, and the timbers, being measurably protected from damp and air, remain good for long periods. But ants sometimes find out the rafters of a house and honeycomb them, making no visible sign of their presence. The timber then suddenly gives way, letting down the mass of earth, imperiling life and injuring the household belongings.

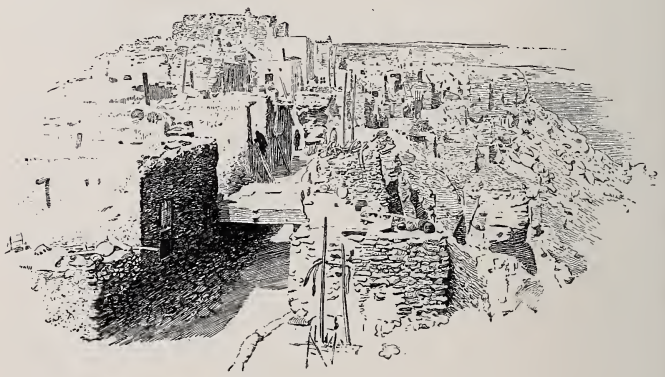
One might think that the adobe house would be a perishable structure. In a land of rains, of much freezing and thawing, it might be; but there are adobe houses in New Mexico and Arizona centuries old, and as good as when first built.

Some adobe houses have walls eight feet thick. These were built not only for protection against heat and cold, but also as defenses against Indians and other enemies.

The adobe house is the outcome of ages of experience in a climate of peculiar conditions. Even the wealthy Mexican of to-day, educated it may be in Washington or St. Louis, builds preferably an adobe house. If one is built on a stone

foundation, with hooded windows, far-projecting roof, and with balconies or portals, there is no more comfortable, weatherproof, picturesque dwelling. For a small expenditure a house can be built in which not an hour of discomfort from heat or cold need be spent in all the year.

SARAH WINTER KELLOGG.



THE MAKING OF FIREWORKS

The American Fourth of July means more than an exhibition of patriotism and a day of boisterous fun. It means a livelihood for about five thousand people in the United States, and for many times that number in China and Japan.

In America are made the Roman candles, the pin wheels, the rockets; in China, the firecrackers and "rattan" bombs (large firecrackers in which strips of bamboo are substituted for paper); in Japan, the finest of fancy fireworks.

Other nations have often tried to compete with the Chinese in the manufacture of firecrackers, but in each instance they have been obliged to give it up. They cannot afford to make them and sell them at the price for which Chinese firecrackers are sold.

A box of firecrackers of the ordinary size contains forty packages, each one made up of sixty-four firecrackers. After these twenty-five hundred and more firecrackers have been braided into

packages covered with bright red and gold paper labels; after they have been packed in a box which in its turn is labeled and then wrapped in matting; after an import duty of one hundred per cent and the freight over the thousands of miles of sea and land lying between China and New York have been paid,—the firecrackers are sold at wholesale for from ninety to ninety-five cents a box. To add to the wonder of the thing, every one of the Chinaman's firecrackers is made entirely by hand. Hundreds of thousands of boxes are imported into the United States every year.

The most delicate and altogether wonderful fireworks are the bombs made by the Japanese to be exploded in the daytime. These bombs are sometimes spherical in shape and sometimes cylindrical, and occasionally the two forms are combined in a cylinder with a ball at one end.

Fired from steel mortars the bombs explode in mid-air. After the smoke has cleared away, a figure of some sort goes floating off in the upper air. Two enormous dragons twist and turn, as if in mortal combat, until St. George, in the guise of their own fiery tongues, bids them begone, and they vanish in a puff of smoke. Perhaps the

Japanese goddess of mirth hilariously waves a little three-cornered flag with a square hole in it and smiles benignly down until she has sailed away out of sight. The combinations produced in these day fireworks are almost endless.

The figures are bags made of very thin, air-tight paper. The explosion of the bomb inflates them with hot air, and there comes into operation the principle of which we take advantage in "fire balloons"—which, by the way, are made in a bewildering variety of shapes and colors by the Japanese.

Very beautiful and almost unaccountable effects are produced at night also by the Japanese bomb makers. Perhaps, after the bomb explodes, a gigantic cluster of grapes hangs suspended in the sky, the colors changing gradually from a dark, rich purple to a brilliant silver or gold, and finally fading away, one grape at a time. The Japanese in olden times said that when the grapes were gone they had been plucked by the gods; and during times of peace and plenty—which were unfortunately few—they often offered these fiery delicacies to the particular god or goddess to whom they attributed their good fortune.

Brilliant "cloud pictures" are also made by the Japanese by exploding bombs. The sky is at first lighted up with a dull glow, which slowly concentrates into a silvery cloud. This changes color many times, and finally rolls open like a scroll and disappears, leaving in its place dozens of tiny floating umbrellas, each with a little flame at the bottom of its handle which burns upward, fitfully illuminating the others and itself as they slowly circle toward the earth, until they are all consumed. Sometimes many little lighted lanterns float about until they are "snatched by the little gods to light them to bed."

All the "set pieces" displayed on the Fourth — fiery portraits of George Washington and spirited spark pictures of the "boys of '76" — are made in America.

Every one knows what a Roman candle is, but few know how it is made. First of all in the making comes the pasteboard cylinder, which is plugged up at one end with clay. After the clay comes a small charge of powder; then a "star" is pushed tight down on the powder, and charges of powder and "stars" alternate until the cylinder is filled. Then a fuse is attached which

communicates with the powder nearest the top of the cylinder, which, when it is exploded, sends its "star" sailing upward. A fuse running through the candle connects the other charges of powder with the first, and explodes them one at a time, each one shooting out the star which is next above it.

The stars are made of chemical mixtures which vary with the colors that are produced. A red star is sometimes made by mixing four parts of dry nitrate of strontia and fifteen parts of pulverized gunpowder. Copper filings change the color to green. Rosin, salt, and a small quantity of amber make it yellow. Small particles of zinc change it to blue; and another and perhaps better red can be made by using a mixture of lampblack and niter. The white stars in the cheap "one-ball candles" are merely balls of cotton soaked with benzine.

Scarcely less indispensable to the Fourth of July celebration is the skyrocket. But hundreds of years before a Fourth of July celebration was thought of the skyrocket was used as a warlike projectile. We are indebted to the Chinese for this also, though all the rockets that are now used in America are of American manufacture.

The rocket was used for purposes of war in China as long ago as the early part of the eighth century. It was soon adopted by the Europeans, who, however, up to the first part of the present century used it mainly for signaling and as a means of setting fire to besieged cities. Many improvements have been introduced, and rockets are made which will carry a five-pound shot six thousand yards. The motive power is the pressure against the air of gases generated by the burning of the composition which the rocket contains. The gases escape through holes or vents in the base of the cylinder containing the composition, and thus give to the rocket a forward or upward motion, as the case may be. The long stick or tail is added to keep the projectile steady in its course.

The composition with which the ordinary exhibition rocket is filled is made of niter, charcoal, and sulphur; and the brilliant sparks and stars of the long, fiery trail are iron or steel filings or borings, made red-hot by the burning composition and expelled with the gases. These form what is known in the trade as "Chinese brilliant fire."

EDWARD MARSHALL.

IN AN ICE FACTORY

Signboards bearing the legend "Boston Ice" over the doors of cellars and other places where ice is kept for sale have long been a familiar sight in the South. During the last twenty years, however, nearly every Southern town of importance has established its own factory for making ice, and the process has become so perfect and cheap that the artificial ice competes with the natural article shipped from the New England states.

The cost of transportation and handling, and the enormous waste by melting, all serve to make "Boston ice" costly to the consumer in the South. This has stimulated the invention of improved methods of making artificial ice.

On his first visit to an ice factory one who is not familiar with ice-making machinery will be surprised to see large steam engines and boilers, with great piles of coal, and will wonder how the use of fire and steam can assist in producing cold;

but a little understanding of the chemistry of the process will enable him to perceive the need of such machinery.

All objects are pervaded by latent or insensible heat. The capacity for retaining this heat varies in different substances. One solid retains more than another, liquids more than solids, and gases more than liquids. If gases be compressed in volume their heat-retaining capacity will be reduced in proportion.

If ten parts of gas be compressed into one, the heat of the other nine parts is evolved and driven off, and the remaining tenth loses some of its heat, because its increased density has reduced its capacity for retaining its latent heat.

Nearly all of the known gases may be compressed until they assume the liquid form. Ammoniacal gas, when subjected to a pressure of about one hundred and fifty pounds to the square inch, becomes a liquid. Should the pressure be now removed, the liquid ammonia will instantly rush, or expand, into the gaseous form again. In doing so it becomes intensely cold, and consequently absorbs heat from everything which is in contact with it.

If this expansion into gas be allowed to take place in pipes immersed in brine, it will cause the brine to become cold enough to freeze fresh water in cans suspended in the brine, and to convert the fresh water in the cans into solid ice. Where the object is only to cool breweries, ships, or storage rooms for meats, the cold brine is pumped and made to circulate through a series of pipes in the rooms intended to be kept cool.

The greater part of the ammonia and ammoniacal salts industrially used is obtained from the dry distillation of coals, as in the making of coal gas, where the ammonia is a by-product, that is, a product obtained incidentally in the manufacture of something else.

Water will absorb a large proportion of ammonia gas, and the solution is called *aqua ammonia*, or hartshorn. The liquid ammonia used in the manufacture of ice is ammonia gas deprived of water and compressed into iron cylinders until it becomes a liquid.

In the factories which freeze the water in cans there is provided a very large brine chamber, or vat, so deep that the cans may be immersed in it nearly to their tops. The cans are about four

feet deep, and are made of galvanized iron. They are filled with pure water, and let down into the brine through openings in the top of the vat. Between the rows of water cans are tiers of iron pipes running back and forth through the brine; and throughout these pipes the expansion of gas takes place, cooling the brine to ten degrees above zero.

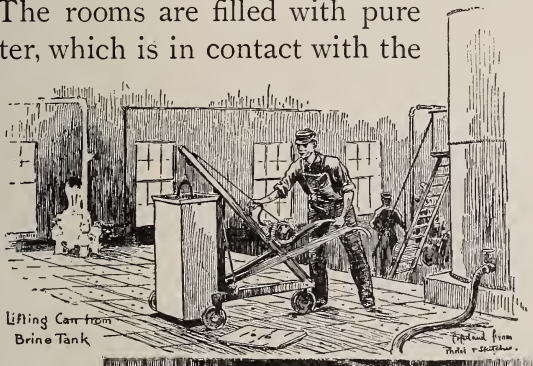
Under the influence of this intense cold ice soon begins to form on the inside and bottom of the cans. It becomes thicker and thicker, until it is finally a solid mass of clear, crystal ice, usually with a small core of opaque or snowy ice through the center.

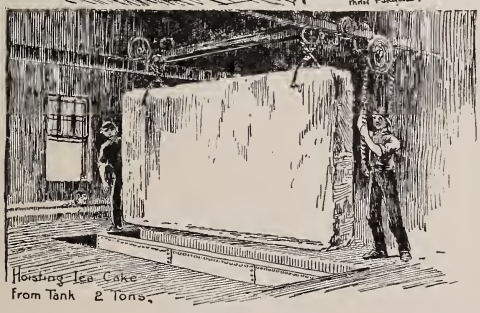
As fast as their contents are frozen the cans are removed by a special lifting apparatus, and dipped for a minute into hot water to loosen the block from the can. Then it slides out easily and is stored away for use.

There are factories conducted on a somewhat different plan, in which the ice is made to form on iron plates in cakes weighing several tons each. In these factories the brine chamber is in the shape of double partition walls of iron plates about four inches apart. The partition divides a

deep wooden water tank into two equal rooms, and in the narrow space between the iron plates the brine and pipes for the ammonia gas are placed.

The rooms are filled with pure water, which is in contact with the





brine chamber on one side. Ice soon begins to form on the iron side plates, precisely in the same way as on a pond or river, except that the sheet of ice is vertical instead of horizontal. Only about half of the water in the rooms is allowed to freeze.

When the cakes of ice are considered to be of sufficient thickness, the cold brine is pumped out of its compartment into another tank, and its place is filled with water of ordinary temperature.

This soon thaws the ice cakes loose from the plates, and allows the mass of ice to be lifted out by hoisting machinery. The ice is then passed on to the sawing machine, which divides it into blocks weighing about two hundred pounds each.

The only essential difference in the two systems described lies in the fact that in the can method all the water is frozen, and if there is any impurity in the water the ice will contain it. In the plate method the ice is formed entirely from one side of the cake, and only about one half of the water is allowed to congeal into solid ice.

Since water in freezing tends to purify itself in the way in which the natural ice of ponds and rivers purifies itself, the plate method more nearly resembles the natural way, and the ice shows its characteristic structure.

After having performed its work in cooling the brine, the expanded gas is drawn from the pipes by means of powerful steam pumps; it is then compressed into a coil of iron pipes kept immersed

in a tank of cold, running water. This compression of the expanded gas requires very heavy machinery, and the operation develops much heat, which is absorbed by the running water.

In other words, the expanding gas, having absorbed much heat from the brine, and having been made cold by this means, must be deprived of the heat thus gained by compression again into a coil surrounded by running water, which takes away the heat as fast as it is developed by the compression.

Being now restored to the liquid form, the gas is ready to go on another round, and may be used again and again. The only loss of gas sustained is from leaky joints in the pipes.

It is a curious sight to see these pipes and pumps coated, even in the hottest weather, with a thick layer of snow-white frost, so thick that it may be scraped off with the hands and squeezed into a snowball. The brine pumps soon lose their characteristic shape and are scarcely recognizable, looking more like a fantastic snowdrift than a piece of iron machinery.

Sometimes we see fine fruit or a bouquet of flowers which has been so placed in the water as

to become frozen in the center of a large block of crystal ice. Such objects form beautiful ornaments while they last.

Many people believe that coal is really at the foundation of cheap ice, and that it will presently be cheaper to use coal to make ice than to use it in transporting ice to the place where it is wanted. Artificial ice is already produced in considerable quantities in districts where natural ice is also cut for the market.

THOMAS C. HARRIS.

A BOSTON MARKET

While the first of the sleepy milkmen are going their rounds, and the luxurious man lies fathoms deep in one of his half-dozen morning naps, the markets which feed great cities are teeming with bustle and interest. If the citizen of Boston who finds a comfortable breakfast on his table is curious to trace its source beyond the kitchen, he may rise at cockcrow and visit the old historic Faneuil Hall Market owned by his city.

He will hardly be among the earliest comers, however, for the wagons of the market gardeners, laden with fruit and vegetables, often start at nightfall, and sometimes at four o'clock in the afternoon, that they may be at the market betimes next morning. Many of these men drive in from towns immediately adjoining the city; but some of them come from places thirty-five miles away, seeking short cuts that they may be first at the ferries and first in reaching their destination and securing standing ground there.

Arrived at the market, whether at midnight or in the morning darkness, the men arrange their wagons in short, orderly rows beside the great building, so that plenty of space is left in which to drive and walk between the groups. Then the horses are unharnessed and stabled, and the carefully covered wagons left in charge of the night watchmen, who also guard the boxes and barrels left outside the building, while the sleepy drivers find some comfortable corner to drowse in until the moment of action.

With the first peep of light they are back at their posts, and begin to uncover their loads, chatting together, exchanging jokes, and talking over the probable market prices for the day.

Presently appear the picturesque figures of women, with rough, uncovered hair, tattered dresses, and faded shawls, each bearing a capacious basket on one arm. They wander about, hoping to pick up a discarded vegetable here and there, and waiting for the barrels of refuse to be brought out from the stalls within.

When these barrels are deposited on the sidewalk an eager search begins, and the baskets are speedily enriched with cauliflowers which show

the first brown specks of decay, bunches of celery containing one or two perfect stalks, and sweet potatoes partially spongy from age or misfortune.

Faneuil Hall Market

With every increasing ray of light come wagons from the provision stores and smaller markets of the city, to select from the waiting carts large quantities of the vegetables and fruit needed for their daily sales. The scene becomes animated; the broad street is alive with voices. On Friday especially, the day when suburban stores send in for their Saturday's stock of provisions, it is

difficult to find one's way about among the carts without jostling eager bargainers.

Perhaps the most interesting season to visit the market is during the summer or early autumn, when thousands of berry boxes or great loads of peaches arrive daily. A few firms sell their fruit by auction, and this naturally adds a lively excitement to the scene. Groups of Italian owners of fruit stands are on the spot betimes. One marketman says of them, "An Italian starts a stand on nothing, but in a month he comes down here and buys whole loads of fruit for cash."

It is in the autumn that the market wagons are most delightful to the artistic eye. Pale green cabbages, yellow squashes, piles of celery in varie' green, and golden carrots seem actually to light the air.

Meanwhile, as this fruit and vegetable traffic is going on at one side of the market, the meat has arrived on the other, and is rapidly carried into stall and cellar. Great white-covered carts, like emigrant wagons, stand there, packed to the very top with pink and white carcasses; and men adorned by burlap mantles fastened with skewers are busily tossing them into their destined places.

Selling from the Carts

At sunrise a gong strikes, and the market proper, the great building lined with stalls flanking a central walk, is opened to trade. Then the

bustle within is scarcely exceeded by that without. Men hurry about, drawing on their white frocks and overalls, and begin to remove great carcasses of meat from the sacking which has protected them from dust through the night, or hang on huge iron hooks the meat which has just been brought in from the storehouses.

One man is assorting his stock of eggs by testing their freshness. A lighted candle is placed in the side of his egg box, and over this he holds each egg for a second and looks through it before passing it on into its appropriate place. The degree of clearness shown through the shell indicates to his practiced eye the probable age of the egg and its state of freshness.

Meantime, while food of all sorts is magically appearing in such profusion, comes a smaller dealer whose stock is as fresh and sweet as the early morning. This is the water-cress woman, a slight little creature, who comes in tugging a big basket filled with bunches of cress, dark green in its freshness and dripping with moisture. This she sells by the dozen bunches at the different stalls. Then, bringing an odor sweeter than that from "Araby the blest" to those who remember

grandmother's garden, comes a young girl with a basket full of the mints, catnip for the kitty, and sage and sweet marjoram.

Outside the market are new phases of interest everywhere. A clear, triumphant sound breaks upon the air. It is the crow of chanticleer, and looking about, after recovering from the first surprise of hearing a barnyard echo in a city street, one notices several rough coops containing live fowls. Some of these are putting their red-combed heads through the slats, and gazing about in a very inquiring manner, and one is preening her feathers as if to be in gala costume for the sacrifice.

But where do the fish stalls of the market obtain their daily supplies? To find an answer to that question one must walk to the wharf. There boats are coming in laden with the fish, which is bought on the spot by wholesale dealers, and not only supplied to various local markets but also packed and sent away to other towns and cities. The wharf itself, rather slimy with fish drippings, is made lively by men running about with large handcarts filled with the fish which they have just obtained from the boats.

The previous process of loading the carts is a rapid and picturesque one. Large baskets of cod or mackerel are filled on board the little boats, swung up and over the side by means of a rope, and dumped into the cart. The man who fills the basket is hardy and sailorlike, clad in a short jacket or a colored jersey, and the motion with which he spears several fish at a time on a small fork is suggestive of the hayfield. Other boats have come in bringing clams, and these are shoveled into small baskets, dipped in water to be rinsed, and then handed dripping to the wharf.

Returning to the market, we shall find it full of bustle and interest all day long. The marketmen outside, as soon as their stock is sold, drive homeward, sometimes quite early, but often, on days when trade is slow, not until late in the day.

The market itself closes at five o'clock, except on Saturday night, when it is open until nine. A gong strikes fifteen minutes before the closing hour to warn the keepers of stalls to do their daily cleaning up, and when it strikes again its warning note embodies the old nursery rhyme:

Home again, home again, market is done.

ALICE BROWN.

THE MORNING PAPER

The word "editor" is one of the vaguest and most elastic nouns in the English language. In small places it is popularly used to describe all the men about a newspaper office who are not printers. I can remember one case in which the oldest printer — a tall and dignified man with a white beard — was supposed generally to be "one of the editors" as well. Even in great cities much confusion exists about the meaning of this word and its proper use, and people speak loosely of many men as editors who are not editors at all.

Properly speaking there is one man who is *the* editor of a paper. The others are his editorial assistants and his heads of departments, who for convenience are called the news editor, the telegraph editor, the foreign editor, the city editor, or whatever it may be; but they are only editors with a qualifying adjective in front of the title; then come the reporters, who are not even editors with an adjective.

The growth of the mammoth modern daily paper has created a new officer in the journalistic hive, called the managing editor. In many offices he is also the editor; in others there is a nominal editor in chief, either the proprietor of the paper or a prominent politician, who turns over most of his duties and powers to the managing editor; in still other cases a political editor and a practical managing editor work harmoniously side by side.

On some journals the managing editor is a visible figure, known by name to everybody, and he enjoys popular credit for his work. On others he keeps in the background and is rarely heard of outside the newspaper walls. He is like the chief of staff of an army, who must be equally able to understand and execute the plans of a good general or to take charge of the whole battle under a weak or disabled one, and who in either case is the busiest man in the field.

Let us get acquainted with one of these masters of a great New York morning newspaper and gather an idea of the dimensions of the burden which he, like Sisyphus, rolls daily up the hill. To simplify the case we will take a journal on which the managing editor has full control.

His working day at the office begins at noon. Before this time he is supposed to have read at least his own paper, and perhaps one or two others. This, which to other men comes as a

In an Editor's Room

pleasant after-breakfast recreation, is to him a matter of business. It is his preliminary survey of the ground upon which the engagement is to be begun that day, although no man alive can tell where it may not drift before night.

The hour from twelve to one he gives to his private secretary, who is generally a stenographer. First of all the morning's letters are to be attended to. The private secretary has been at work upon the correspondence for an hour or two, so that the managing editor is troubled only with letters which it is important that he should see. He reads or hears them, dictates an answer where it is needed, and gives directions about others.

Next he gets reports from the secretary and the exchange readers as to the position of his paper among the other papers that morning. Sheets of clippings arranged for comparison enable him to see wherein his reporters have distanced their rivals and wherein they have been beaten in the race for news. At the same time he sees clippings from papers all over the country commenting on his paper, its policy and its general features.

At one o'clock it is time for him to talk with his chief subordinates, that is, the heads of departments. They are summoned in, one by one; and he learns what assignments have already been made, and gets a general idea of what the main features of the paper are likely to be.

He makes suggestions upon this information, pointing out the matters upon which stress is to be laid and directing further assignments of special reporters to certain lines of work. He then dictates and sends out his first batch of dispatches to the paper's correspondents at Washington, London, Chicago, San Francisco,—wherever there is a point of contact with this news that has been discussed,—ordering inquiries and reports. Fifty or more of these dispatches may be sent at this time. Then he has a hurried lunch.

From two to three the managing editor generally sees people by appointment. Of course there are certain important persons who can secure an audience at practically any time, but for the general public restrictions are necessary.

Then comes a half hour devoted to a task which will surprise the ordinary layman. Whether it be Monday or Wednesday or Friday, this half hour is given to preparations for the Sunday paper,—a regular charge upon the time of every week day. The Sunday paper has grown to be a veritable magazine, generally with serial stories, frequently with illustrations, and always with a great mass of special literary and news features, foreign

correspondence, poems, reviews, and exceptional matter of all sorts.

About half past three the first of the afternoon papers come in. The managing editor, going over these, now sees the coming paper more clearly outlined, — particularly as to the editorial page. He talks now with his leader writers, directs articles on such and such topics, and discourses more or less briefly to each on the way the subject should be treated, and on the paper's attitude toward any new questions involved.

All this time he has been subjected to frequent interruptions by subordinates bringing in fresh matters of news interest and asking for instructions. As the afternoon wears on these interruptions multiply. The telegraphic bulletins from remote correspondents, too, which began earlier in the day, are now falling thick as autumn leaves. They are read and piled up according to importance, pending decision. Naturally each of these local representatives regards his own particular sensation as the chief feature of the day's news. His zeal is not lessened, either, by the probable fact that the longer the account he can get printed the larger his pay will be, — for all the far-away

correspondents of a paper, save those of course in great news centers like Washington and London, are paid by the column.

It is now nearly six o'clock. The editor has received from his leader writers the most of their writing. He has edited it and put it into the box, along with other matter for the editorial page, to be sent up to the composing room as a start for the printers, who begin work at six. He has also sent up sundry "reprint" matter, or extracts from other papers, which will prevent the printers getting out of "copy,"—which means having nothing to do.

Now comes the conference with the business manager,—one of the important things of the day. From this the editor learns the state of the transient advertising, which varies literally by scores of columns, according to the weather, the season, and a dozen other circumstances. He decides then upon the size of his paper,—whether it shall be of four pages, six, or eight, or even more.

Of course some great news event, like the death of the President, the sinking of an ocean steamship with heavy loss of life, or some other exciting occurrence, would also dictate an enlargement of

the paper; but as a rule it depends upon the advertising, and is settled at the close of business hours.

This decision is not wholly final. Advertising in bulk, or some extraordinary happening, may come as late as midnight to render an increase of pages necessary. After midnight it would be very difficult to make the change, because there would not be time in the press room to wet the paper and make other needful preparations.

At six o'clock, or as soon as he learns about the advertising, the managing editor begins to shape his paper. He knows now how much space he has, and he proceeds to allot it among the departments, — so much for general telegraphic news, so much for local, for political, for foreign, for markets, and the like. Of the hundred and more offers of special dispatches, perhaps thirty are accepted, perhaps sixty, as the demands of the paper dictate. The answer usually limits the amount of matter to be sent and is stated in hundreds of words. At this time, too, such instructions as are necessary are wired to the regular correspondents at Washington and other points in America. Orders sent to cable correspondents

in London or Paris must have been dispatched hours before, as it is now nearly midnight in western Europe.

At about half past six the editor is able to think of dinner. He has a talk with the night editor,

who has just arrived, — advising with him as to what has been done, what things to expand, what matters to keep down, — and then goes out. This intermission for dinner usually lasts until half past nine. It may be extended; quite as often it is abridged. Such as it is, it is the only time in the

whole day that the managing editor has with his family or at his club.

When he returns to the editorial rooms, between nine and ten, the paper has begun to shape itself. He is now able to see what the creature will be like. Some of the special telegrams have come in. The revised editorial proofs and proofs of a portion of the news articles are on his desk.

He discovers that some of the dispatches he has ordered are useless; a column of city news he had counted upon has failed owing to the refusal of some man to be interviewed; a letter has appeared in Boston which will compel the alteration of one of the editorial articles, and the leader writer who remains at the office for such emergencies is called in and notified.

On the other hand, some great event — a railroad collision, the explosion of a ferryboat, a European sensation — may have loomed up on the horizon, demanding attention and space and altering the relative importance of everything else in the paper. All these and a hundred other unlooked-for contingencies springing up on every side about him he must meet as they arise, deciding yes or no on the instant.

So midnight comes and the great task approaches completion. The editor has been reading proofs, writing or dictating short editorial paragraphs on late news items, hearing verbal reports, keeping his finger on the pulse of every division in the establishment. He begins now the final work by "making up" the editorial page.

This may mean merely the sending to the foreman of the composing room a schedule giving the editorial articles in the order in which they must come. But if the managing editor is a practical man, he spends more or less of his time in the composing room looking over the type in the forms and dictating the details of arrangement.

If it is an important night, with special features in the paper, he may remain until three o'clock, or even until the paper goes to press. If matters are going smoothly, he has a five minutes' talk with the night editor at one o'clock or thereabout, — telling him what articles to display on the first page, what things are of the most importance, and what can be left out, — and then goes home.

A reasonably busy day, you say, and there are seven of them in every week.

HAROLD FREDERIC.